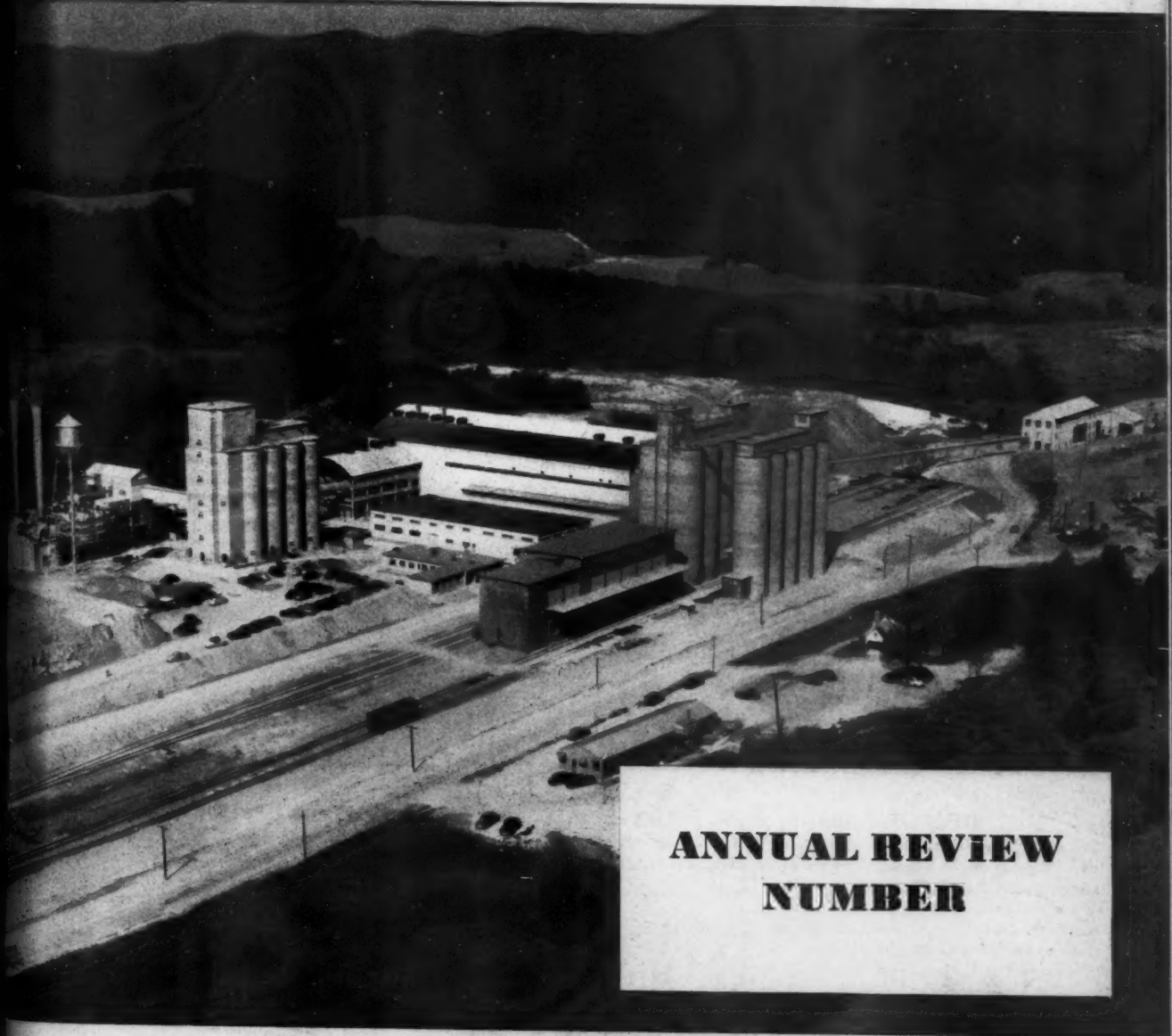
Mining CONGRESS JOURNAL

FEBRUARY
1952



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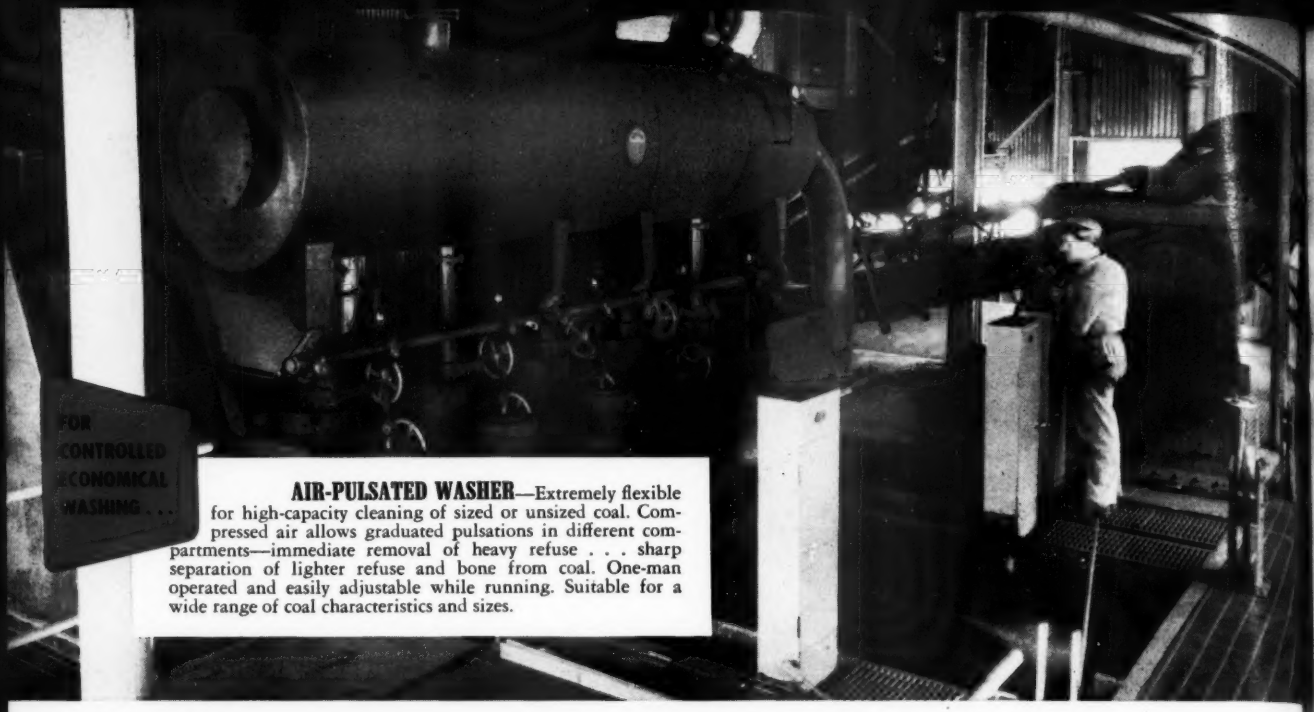


FOR CONTROLLED ECONOMICAL WASHING . . .

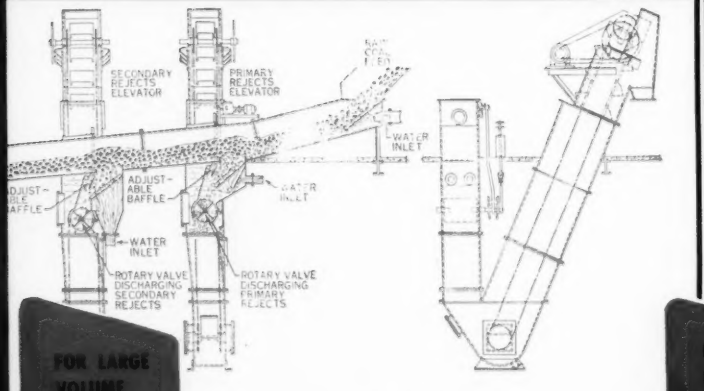
AIR-PULSATED WASHER—Extremely flexible for high-capacity cleaning of sized or unsized coal. Compressed air allows graduated pulsations in different compartments—immediate removal of heavy refuse . . . sharp separation of lighter refuse and bone from coal. One-man operated and easily adjustable while running. Suitable for a wide range of coal characteristics and sizes.

How to wash coal more economically...

Get the right LINK-BELT Coal Washer to match your coal seam and your markets

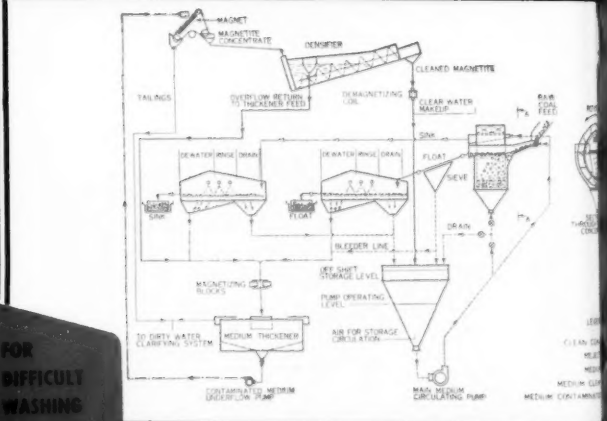
SELLING coal today in an expanding market that's getting more and more demanding requires peak cleaning efficiencies... lower cleaning costs. That's why so many progressive mine operators call on Link-Belt.

For Link-Belt offers three types of coal washers... each designed for a different set of requirements... each tops in its field. Why not have a Link-Belt coal preparation specialist help you and your consultants map out your coal washing plans.



FOR LARGE VOLUME AT LOW COST . . .

TROUGH SEPARATOR—By placing a Link-Belt Trough Separator ahead of the Air-Pulsated Washer, a large additional capacity can be cleaned with little added investment or operating expense. Trough floats off a large part of the coal so clean it requires no further treatment. Remaining coal and middlings then go to air-pulsated jig.



FOR DIFFICULT WASHING JOBS . . .

FLOAT-SINK CONCENTRATOR — Latest advance in coal cleaning — utilizes Heavy-Media* separation process. Efficient for extremely high or low specific gravity separation . . . when a large percentage of coal is near the separation gravity . . . when amount of impurities in feed fluctuates or product must be quickly changed. Cleans larger sizes, reducing necessity for manual picking.

LINK-BELT

COAL PREPARATION and HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8, Springs (South Africa). 12.297

* The Heavy-Media Separation Processes are licensed by the American Zinc, Lead and Smelting Co. American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., are their sole Technical and Sales Representatives for these processes.

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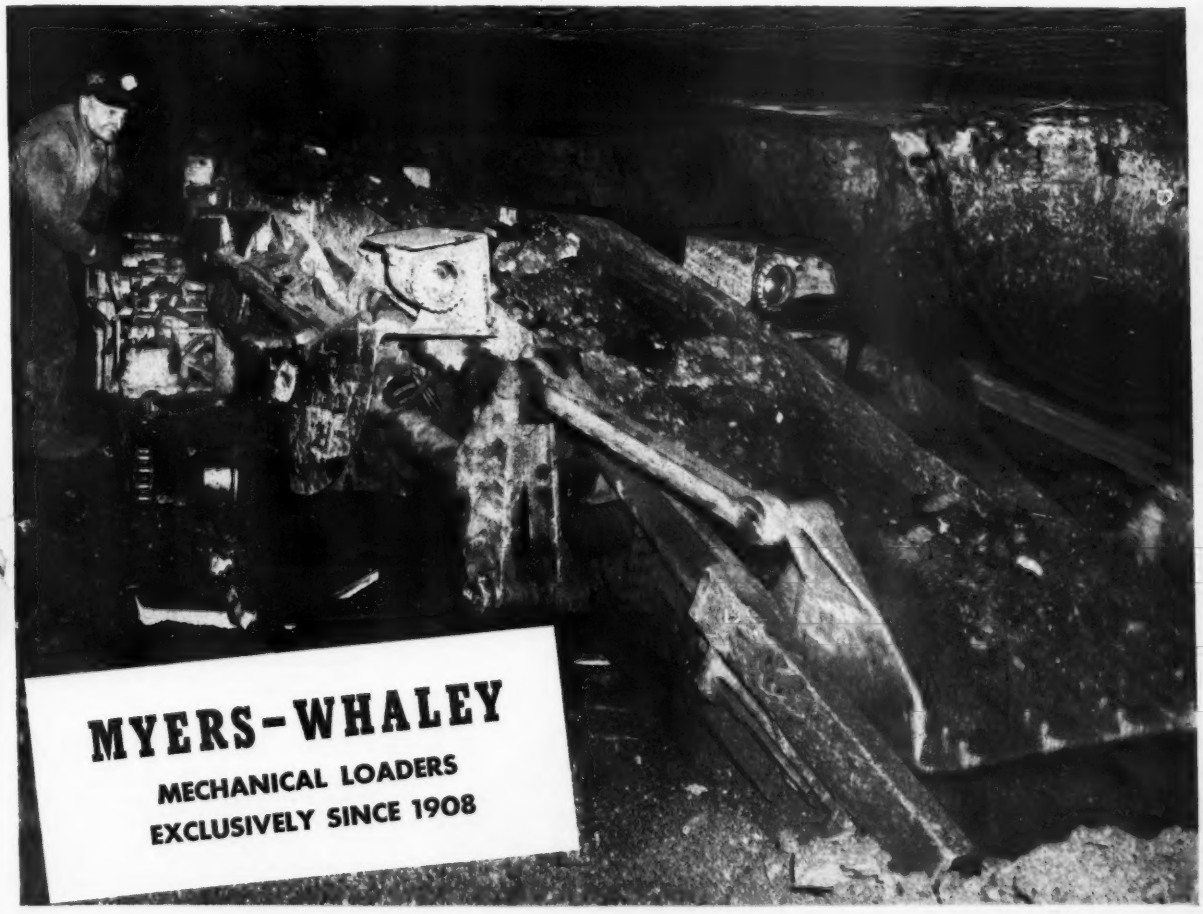
Call it enginous engineering . . . or just plain mechanical endurance! The important thing is that the powerful Whaley "Automat" has the built-in ability to stay on the job longer—loading consistently day-in and day-out!

For more than 43 years our entire engineering ability has been devoted to building loading machines exclusively! We believe we know the requirements that make mechanical loading most effective and most profitable. One of these requirements is consistent loading. Capacity means absolutely nothing when your loader is down. The "Automat's" rugged construction guarantees an absolute minimum of loader break-down delays. The "Automat's" simplicity guarantees a quick repair and early return to loading. Result: Consistent, Efficient loading in any class of material!

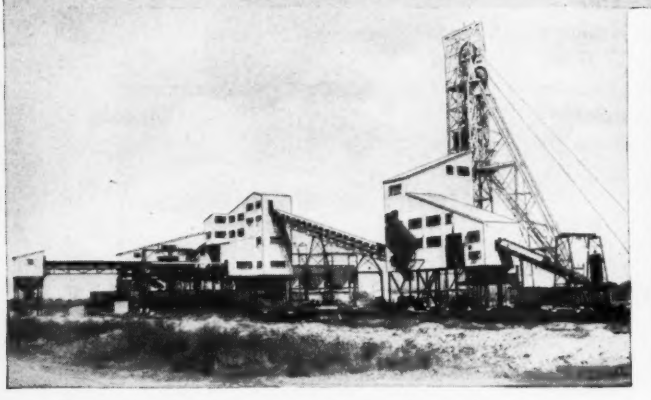
Investigate the powerful Whaley "Automat" now! Write for our new Catalog 250 giving you every detail of the consistent loader! Myers-Whaley Co., Knoxville, Tenn.



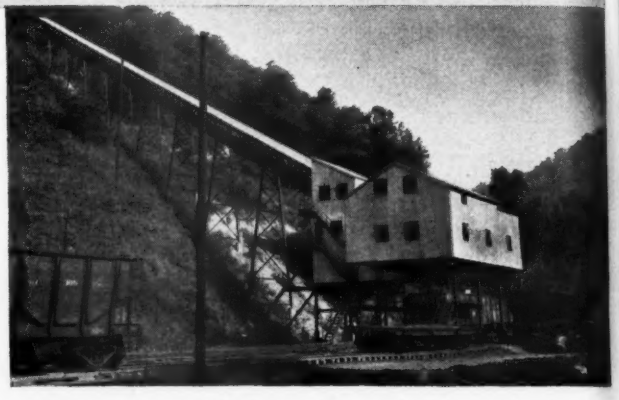
ROBERTS and SCHAEFER COMPANY:

HEADQUARTERS FOR COORDINATED ENGINEERING AND CONSTRUCTION SERVICE

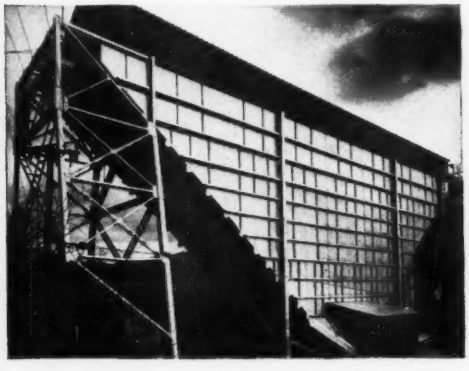
A short picture-story of R&S services and facilities available to you for your next engineering and construction project —the whole job or any part of it, any time you are ready.



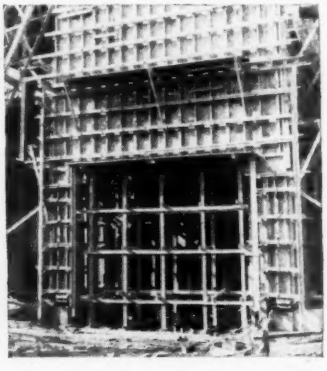
600 tons-per-hour of run-of-mine coal: that's the capacity of this new preparation plant at Peabody Coal Company's Pana Mine No. 17. No matter how big the project, R&S is staffed to handle it—any place in the world, any time you are ready.



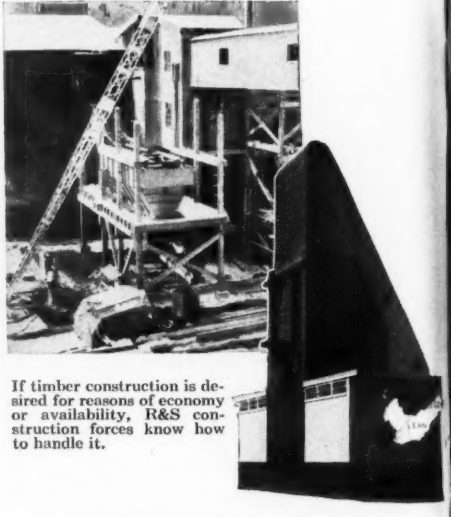
This plant was dismantled, moved and re-erected at this new site by Roberts and Schaefer Company construction forces. You can save time, money and headaches by consulting R&S when you contemplate changes in *your* plant.



Here is steel construction at its best—this enormous bin designed and constructed by Roberts and Schaefer Company for the Blue Diamond Coal Company.

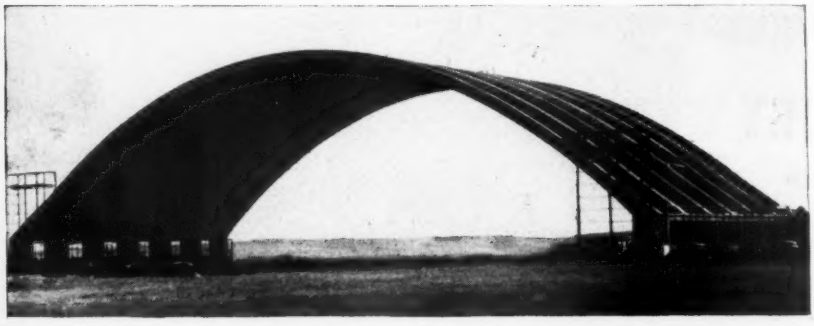


When you see form work like this on a concrete construction project you know it's being done right—the R&S way.

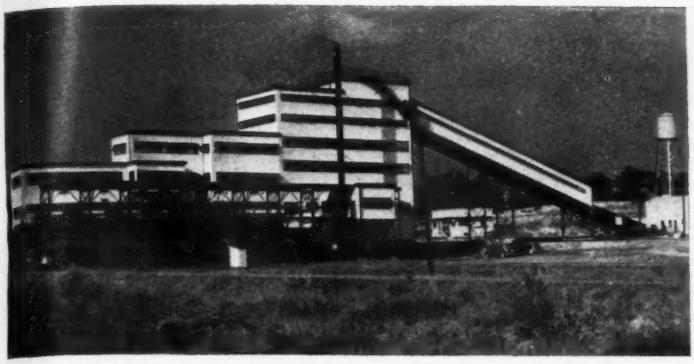


If timber construction is desired for reasons of economy or availability, R&S construction forces know how to handle it.

This modern coaling station is an example of R&S design applied to a basic materials handling problem.



This R&S-engineered "shell roof" concrete hangar has 340-feet unsupported span—the longest in the world. Your next project may not require this calibre of engineering excellence, but it is assuring to know that such engineering is available when you need it—and it is an added guarantee that "conventional" assignments will be handled with complete understanding and competence.



This R&S-constructed preparation plant was so successful in operation that the owner ordered a practically identical plant for another mine. Repeat orders are a natural "by-product" of skilled construction . . . completed on schedule.

Engineering and construction of this coal preparation plant, as well as the manufacture of its air-washing equipment, were all done by Roberts and Schaefer Company—the whole job, start to finish. Undivided responsibility can cut costs on your next project too.

R&S was selected to construct this preparation plant at the Bureau of Mines hydrogenation project, Louisiana, Mo.

"Install it and see that it works" is the policy at R&S. Installation of equipment is only one of the many Roberts and Schaefer services.

In this instance R&S worked with the plant owner on everything from site selection and development, through engineering and construction of the basic plant and subsequent additions.

Plans move quickly in this engineering department . . . under the supervision of well-known specialists in the field of civil, mechanical, electrical and architectural design.

This modern manufacturing plant near Chicago is equipped to fabricate many critical items for your project —thus avoiding delays which result from depending upon outside manufacturers.

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Contents

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ADDED to the time-proved superiorities of design and construction which have made Bucyrus-Erie quarry and mining shovels traditionally "years ahead" are important features new to an excavator of this size, yet *thoroughly proved in the field*. Among these 150-B features are:

Exclusive Two-Section Boom with tubular dipper handle free to rotate in saddle block. Used with outstanding success on Bucyrus-Erie's large stripping shovels, this design speeds the working cycle and permits increased *payload* because it reduces front end weight materially yet provides enormous strength. Upper section carries only load resulting from pull of ropes, strong trussed lower section transmits directly to the revolving frame the vibrations, torsional and shock loads set up in digging. Rope crowd is quiet, positive, with crowd machinery located on the deck.

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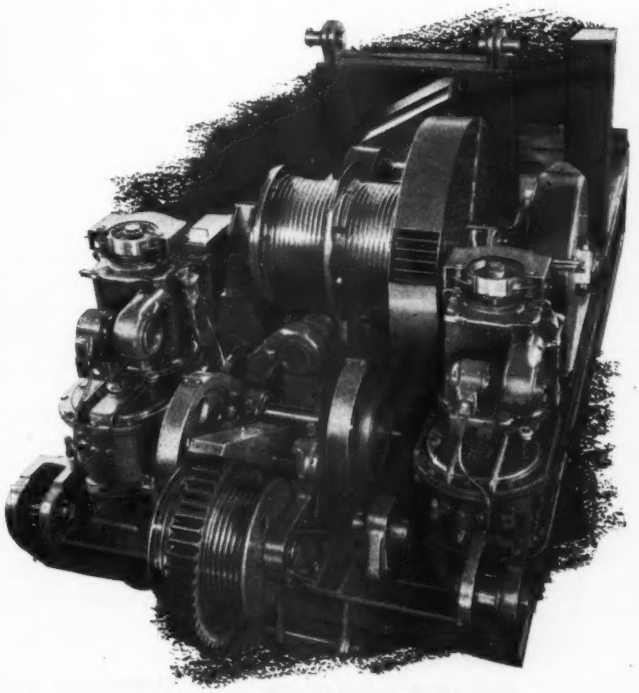
The 150-B has full Ward Leonard independent motor control, is fully convertible to dragline service, features numerous other design advances that make it truly "years ahead". 1L52C



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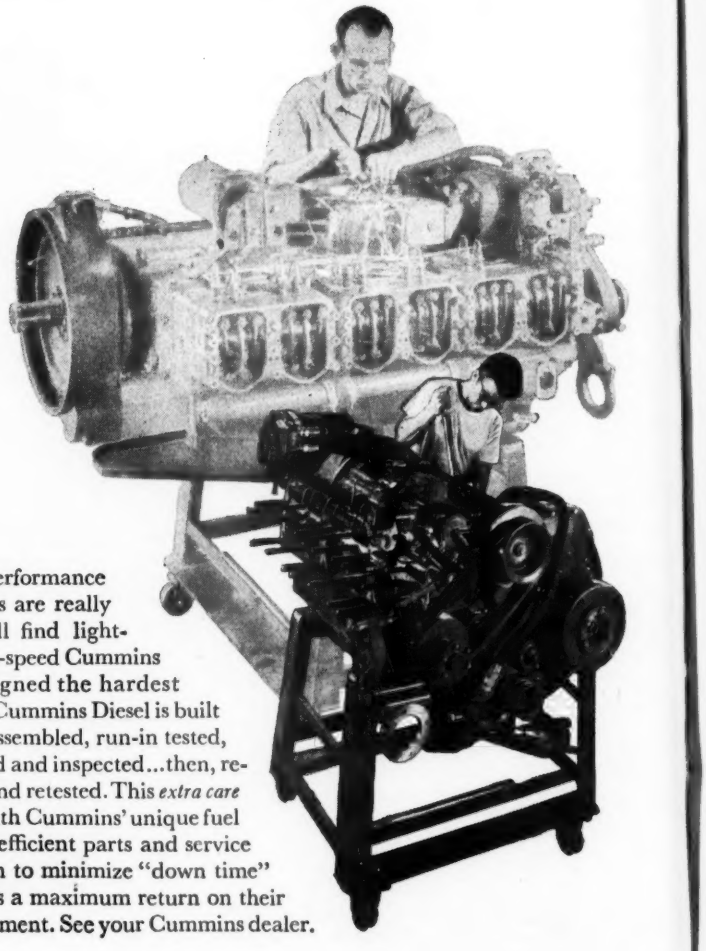

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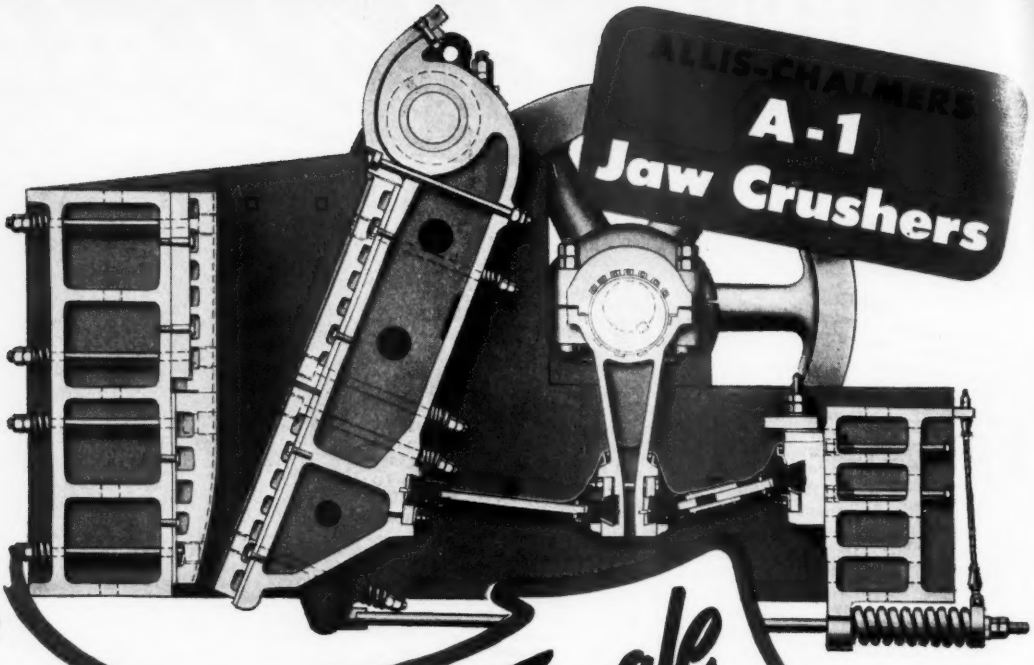
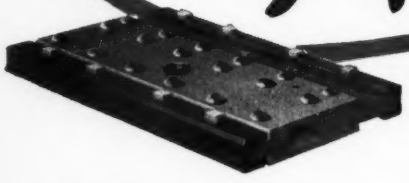


New Dry Rolling Toggle



✓ Outlasts Conventional Toggles
✓ Reduces Maintenance Costs

Dry rolling toggle was developed by Allis-Chalmers for A-1 jaw crushers ...can be installed on other jaw crushers now in use.

The Allis-Chalmers representative in your area will be glad to give you complete facts about A-1 jaw crushers. Allis-Chalmers, Milwaukee 1, Wisconsin.

NO LUBRICATION True rolling action of toggle ends and seats requires no lubrication. No oil lines or lubricant needed. No oil drip from toggles to pit below crusher. Increased safety and cleanliness!

ROLLING ACTION Replaces friction-producing sliding action. Toggle bearings are cold even after 16 hours of tough crushing!

LESS WEAR Rolling rather than sliding action between toggle ends and seats results in greatly reduced wear. Abrasive dust has little or no destructive effect.

LASTS LONGER Improved toggle is safety shear type. Only inexpensive rivets shear off when unbreakable materials enter the crushing chamber. No need to replace the whole toggle! Rivets can be replaced easily in the field.

A-1 and *Pulverator* are Allis-Chalmers trademarks. A-3517

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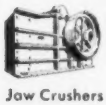
Jaw Crushers


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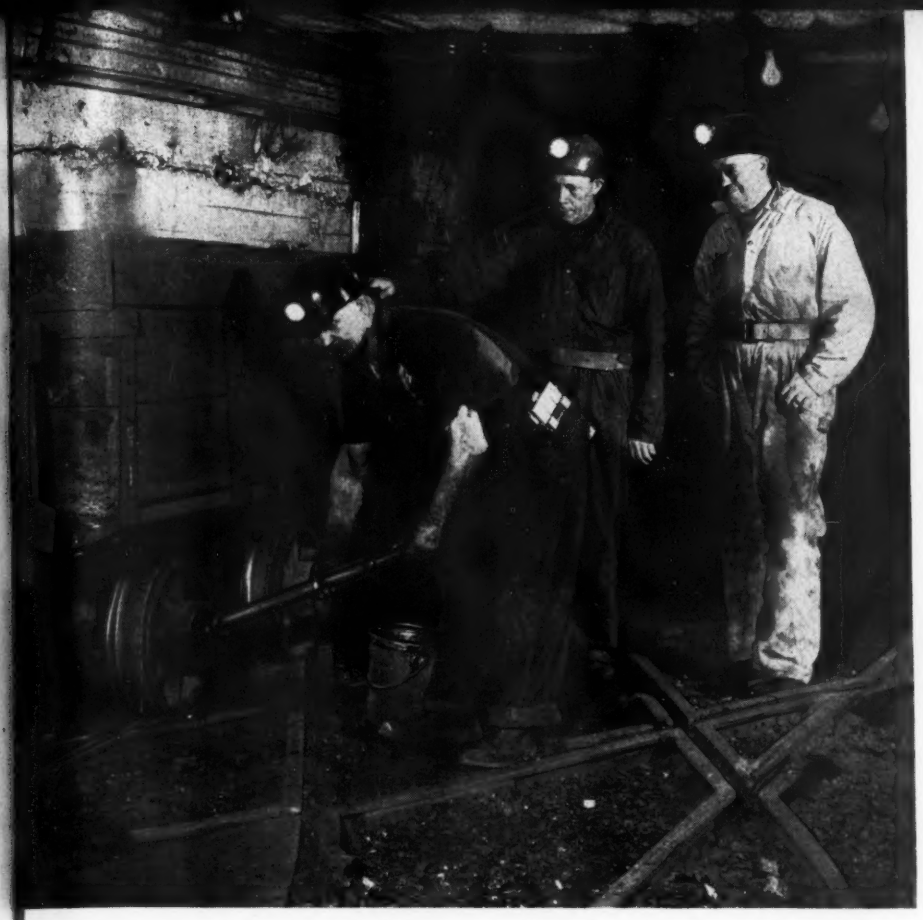
Gyratory Crushers


Kilns, Coolers, Dryers



Taking coal for a ride . . . easier

WITH more than 300 cars handling coal at this midwest mine, lubrication of the wheel bearings could have become a real headache. That's why mine operators switched to SUPERLA Mine Lubricant No. 4 as suggested by a Standard Oil lubrication specialist over four years ago.

Already used in main transmissions and gathering heads of the mine's Joy loaders, SUPERLA Mine Lubricant No. 4 proved superior to other greases for wheel bearing lubrication as well. Leakage from the bearing housings was eliminated and consumption reduced. Motor men reported lower power requirements. Oilers found SUPERLA Mine Lubricant easy to withdraw from the barrel, easy to dispense with hand-operated guns. The versatility of SUPERLA Mine Lubricant No. 4 has both simplified the problem of inventory and reduced overall lubrication costs.

SUPERLA
REG. U. S. PAT. OFF.
Mine Lubricant No. 4

SUPERLA Mine Lubricant No. 4 has solved more than one problem in this mine. Chances are that it (or another SUPERLA Mine Lubricant) can do a similar job for you. There is a Standard Oil lubrication specialist located near your mine. For his help, call your local Standard Oil office today. Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

What's your problem?

J. A. Grieve, lubrication specialist at Standard Oil's Decatur office, helped this midwest mine use SUPERLA Mine Lubricant No. 4 to good advantage. He was close at hand, gave operators engineering service when they needed it.

There's a corps of Standard Oil lubrication specialists throughout the Midwest. You'll find one located near your mine. Through special training and a lot of practical experience, this man has gained a working knowledge of lubrication that can mean real savings for you. To obtain his services, simply contact the nearest Standard Oil office. Discuss with him the savings you can make with such outstanding products as:

STANOIL Industrial Oils—Here's *one* line of oils that provides cleaner operation of loader and crane hydraulic units; supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants—On open gears and wire ropes, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

STANDARD OIL COMPANY STANDARD *(Indiana)*

More Production... at LESS COST

EUCLID
THE PIONEER

PROVED on hundreds of off-the-highway construction and industrial jobs, and in open pit mines and quarries, "Eucs" have the capacity and speed to move more loads faster and at lower cost.

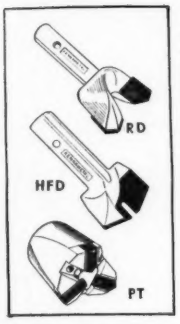
There is a Euclid model for every off-the-highway hauling requirement. Rear Dump "Eucs" of 10 to 34 ton capacity have travel speeds up to 36.3 m.p.h. and are powered by diesel engines of 125 to 400 h.p. Bottom-Dump Euclids range in capacity from 13 to 25 cu. yds., have top loaded speeds up to 34.4 m.p.h., and diesel engines of 190 to 300 h.p.

The Euclid Scraper has proved its dependability and efficiency on the construction of roads, levees, airports and in open pit mining. The Euclid Loader, teamed with the Euclid Bottom-Dump, has set records for low cost earth moving on a wide range of jobs.

You get more production at less cost with Euclids. Call your Euclid Distributor for help with your off-the-highway hauling problems, or write for information on the complete line of Euclid equipment.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

Complete Line of Roof Bits Assures Drilling Efficiency in Any Roof Condition



A unique feature of the Kennametal line of roof bits is that they offer a particular bit for a particular job. This allows the mine operator to obtain from the Kennametal selection a bit that will give maximum drilling efficiency, however easy or difficult drilling conditions may be. The fastest drilling bit of the three is the Style RD Series which drills the more easily drilled roof material like shale and slate. Style HFD Bits which are a radical departure from conventional drill bits are for drilling the medium hard substances encountered in mine roof such as laminated sandstone. Their drilling speeds exceed those of the rock bit, and they can, like the Style RD, be used in coal drills that have been converted to roof drills or in regular roof drills. The Style PT is a multiple-point bit that gives impressive drilling speeds of 10% to 15% faster than those of other multiple-point bits.

John E. Noel Helps Out On Drilling Problem

John E. Noel is the Kennametal representative in Illinois. His experience in the coal industry covers a period of 25 years. When operators in his territory call him they do with confidence in his ability. An example of this was a mine where roof had begun to show signs of weakness over the main haulage belt in a new opening. When John was called he brought the right equipment to do the job efficiently even though working over a belt. He also assisted the drilling crew as it was their first job of this kind. Like Kennametal representatives everywhere, John Noel was able to help these operators make substantial savings by having the right experience and the right drilling tools to help them out.

Kennametal Users Get MORE TONNAGE ... LONGER

by following simple tool maintenance rules

Users of Kennametal Tungsten-Carbide Bits can get more tonnage per shift, and more shifts per bit life by practicing Kennametal's simple bit maintenance recommendations.

FIRST—Determine the point (in places cut or feet drilled) at which the bits *begin* to dull *in your mine.* Thereafter, at that established point, remove bits for reconditioning and replace with sharp bits.

SECOND—Sharpen the bits as recommended for your type of seam—the most efficient cutting angle varies for soft, medium, and hard seams. Kennametal Grinding Instructions booklets carry full details, are available to you free.

THIRD—Use the grinding procedures and the types of grinding wheels specified for tungsten-carbide tools. Do not quench the bits, and always avoid overheating them. Complete descriptions are contained in Kennametal Grinding Instructions booklets, free on request.

Along with increased tonnage, proper bit condition assures further advantages: Machines work easier—there is less strain on cables, jacks, and drives; armature burn-outs are reduced, as are other failures resulting from overloads; bits are ground easier and faster, bit cost is lower, because only a small amount of carbide needs to be ground away; machine and drill operators work more efficiently when they know their bits are always sharp.

Your Kennametal representative will be glad to show you how a bit maintenance plan can give you better tonnage, reduce your costs. Contact him! Kennametal Inc., Latrobe, Pennsylvania.

Names of Kennametal Representatives appear in the McGraw-Hill Mining Catalogs

KENNAMETAL®

DRILL BITS • MACHINE BITS • ROCK BITS • ROOF BITS

Specialists in Coal Cutting and Coal Drilling with Tungsten-Carbide Tools

A Statement by Anaconda on the Copper Situation

MANY users of copper have vital decisions to make . . . usually in connection with the present defense-induced shortages of copper and aluminum. This statement is an effort to remove the smoke screen surrounding the copper picture . . . to wipe away the confusion caused by too much talk supported by too few facts.

Substitution poses problems – Industry has been urged to substitute aluminum and other materials for copper. In some instances this may be logical and practicable. In many others it is difficult, if not impossible. But – before making *any* long-term decisions that may cost a great deal of money in engineering, new plant facilities or rescheduling of production operations – one should know the facts about the future of copper.

New Anaconda projects – The first major increase in copper production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington project in Nevada is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons.

Other new projects – During 1954-55 still other new projects in the U. S. and friendly foreign countries will further augment the increasing copper supply. All told, it is estimated that by 1955, not less than 450,000 tons of copper could be produced annually – over and above present production levels.

Accordingly, in 1955-56, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons yearly. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support a Federal Reserve Board Index of Industrial Production of 270, an increase of 24% over the present, and 45% above the first half of 1950.

• • •

These are the 'things to come' in copper. On the basis of the facts there is no necessity for considering long-range substitution of other materials for the red metal.

52320A

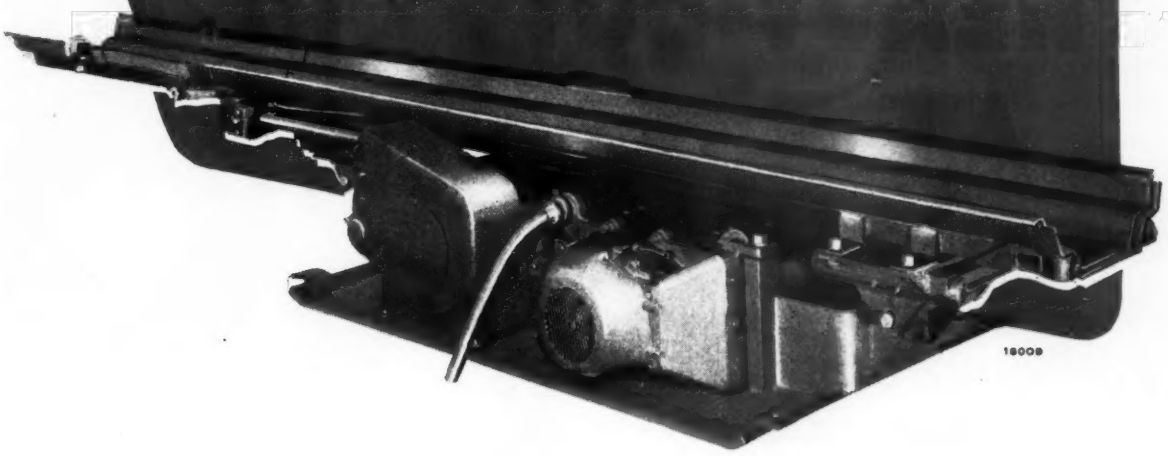
ANACONDA
COPPER MINING COMPANY

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

PRODUCERS OF: Copper, Zinc, Lead, Silver, Gold, Cadmium, Vanadium, Superphosphate, Manganese Ore, Ferromanganese.

MANUFACTURERS OF: Electrical Wires and Cables, Copper, Brass, Bronze and other Copper Alloys in such forms as Sheet, Plate, Tube, Pipe, Rod, Wire, Forgings, Stampings, Extrusions, Flexible Metal Hose and Tubing.

THE NEW Goodman Type L SHAKER CONVEYOR DRIVES



FOR LOW COAL
Over-all Heights 20" and 24"

New gear principle requiring fewer parts delivers the perfect shaker motion to pan line with less stress. Maintenance cost is low, the operation of all accessory equipment is smooth and easy.

Your inquiry for full details of these profit producing drives for low coal will receive prompt attention.

HIGH CAPACITY DRIVES FOR LOWEST WORKABLE SEAMS WITHOUT TAKING TOP OR BOTTOM

Also available are these new labor-saving accessory items: column type troughing, hydraulic jacks, crosscut drive, roller frame for swivel trough which eliminates pendulum, locking handle on trough supports. Let us give you complete information.

Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS
CUTTING MACHINES • CONVEYORS • LOADERS • SHUTTLE CARS • LOCOMOTIVES

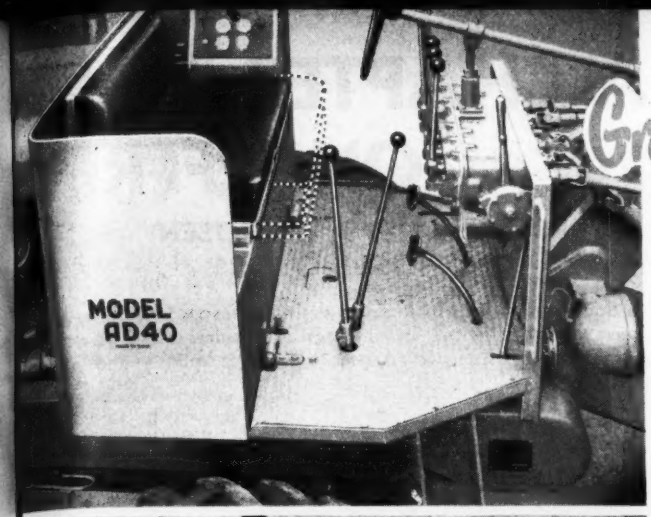
NOW! a Great New HEAVY-DUTY GRADER

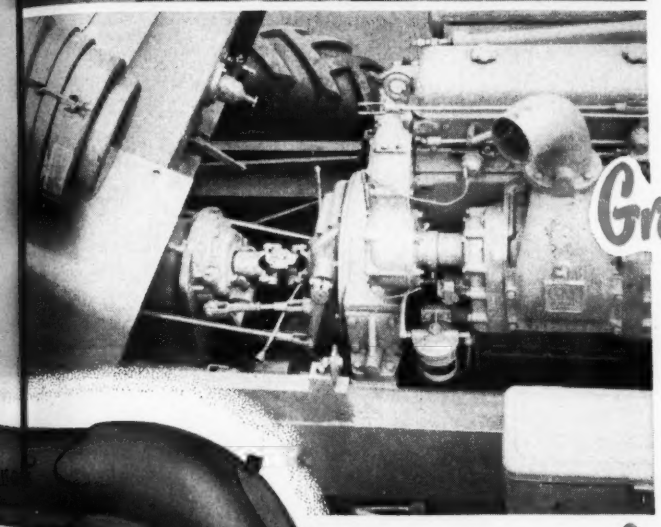
Allis-Chalmers AD-40

Weight—23,000 lb.
(24,800 lb. with optional calcium chloride in tires)

104 Brake hp.

Built to handle All Jobs —FASTER, EASIER





Great New operating ease

No other grader has been designed with the operator more in mind. **Unmatched Visibility**—Single tubular frame from front to platform, new lift cases, low control box and tapered platform give operator a full view of what he is doing. **Feather-Touch Steering**—New hydraulic booster system, fully enclosed in the frame, provides effortless steering with positive control even under toughest conditions. **All-Around Comfort**—Roomy platform, adjustable seat (as shown) and simple controls offer any size operator true comfort—sitting or standing.

Great New service simplicity

Here's maintenance and repair accessibility second to none. Combined fuel tank and seat unit tilts forward for easy access to clutch, transmission and drive shaft. Transmission can be removed without disturbing floor plates. Power take-off and hydraulic pump are mounted outside the dash.

Great New performance

Add these outstanding operator and service advantages to the exclusive Allis-Chalmers features that include ROLL-AWAY* Moldboard—extra high clearances from front to rear—shock-absorbing tubular frame—dependable General Motors 2-Cycle diesel power . . . and you have the finest heavy-duty grader on the market. Get the full story on this new AD-40 from your Allis-Chalmers dealer now.

**ROLL-AWAY is an Allis-Chalmers Trade-mark.*

ALLIS-CHALMERS

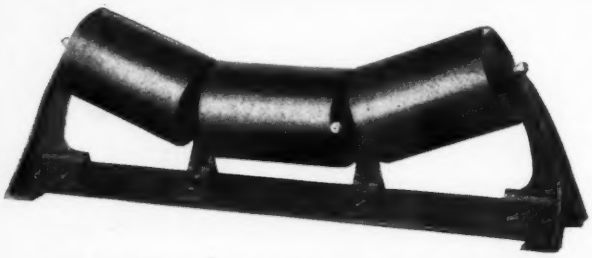
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

• Designed for Your Job • Built to Take It • Easy to Operate • Easy to Service

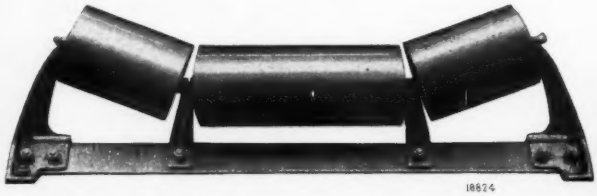
A CHAPTER ON JEFFREY

WHY THEY ARE CHOSEN ON THOSE BIG JOBS . .

No doubt about it . . . there are definite reasons why Jeffrey Belt Conveyors get the call on hundreds of projects where large tonnages must be transported great distances quickly and at low cost.



Standard and Heavy Duty 3-pulley roller bearing Idlers for belt widths from 14" to 60".



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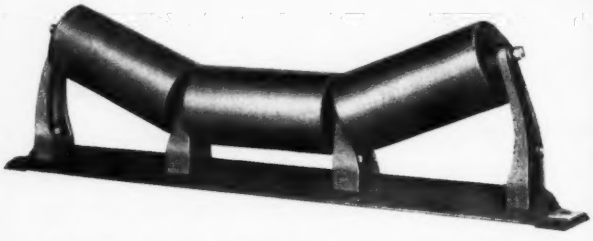
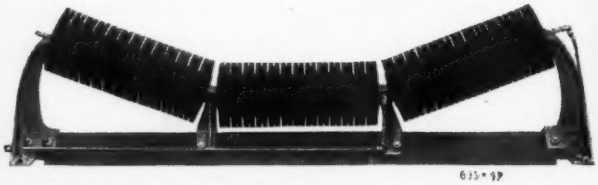
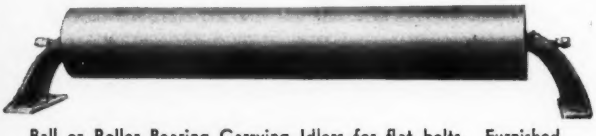
Picking Belt Idlers (with wide center roll) for belt widths from 14" to 60".



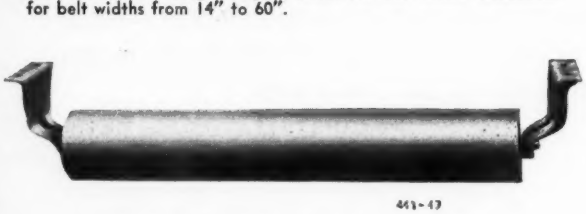
Ball Bearing Belt Idlers for moderate service and belt widths from 14" to 36".



Impact Absorption type Idlers with heavy duty bearings, shafts and shells to withstand shocks and heavy loads. Rubber rolls independent of each other—are renewable.



Ball or Roller Bearing Carrying Idlers for flat belts. Furnished for belt widths from 14" to 60".



Standard Ball or Roller Bearing Return Idlers.

Rubber-covered Spool type Return Idlers. Independnt rolls for variable spacing across width of belt—provide cleaning action.

Illustration shows an outstanding Conveyor job, complete with self-propelled Stacker (in foreground). Belts covered to provide protection from the elements. Note small photo (upper-right) showing end of Stacker delivering material to stock pile.

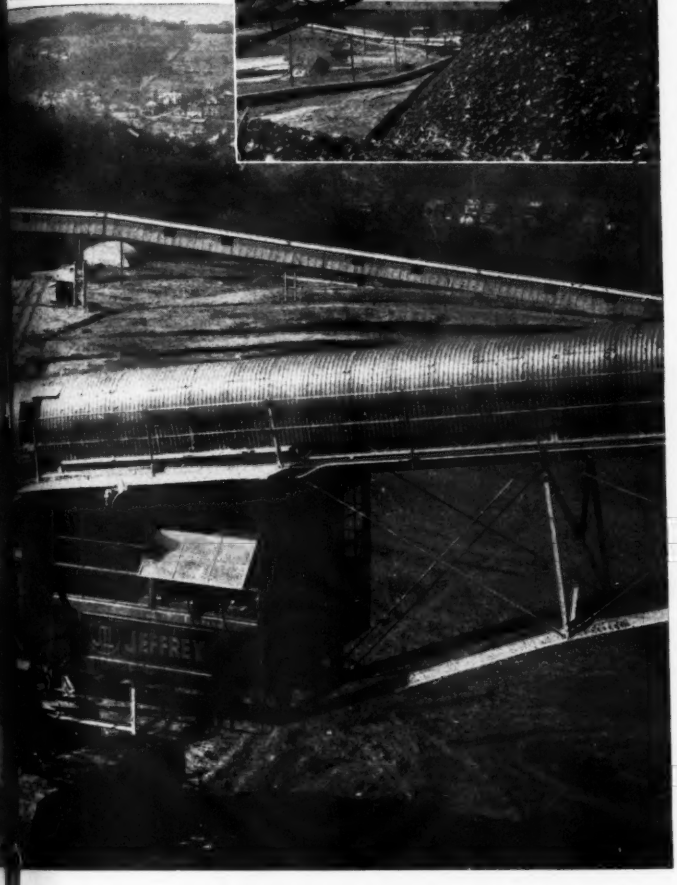
Back of it all is sound engineering and experience. Knowing th right type of Idlers to specify is very important. You see, ou engineers are specialists . . . know that a Belt Conveyor function no better than the Idlers upon which the belt carries material.

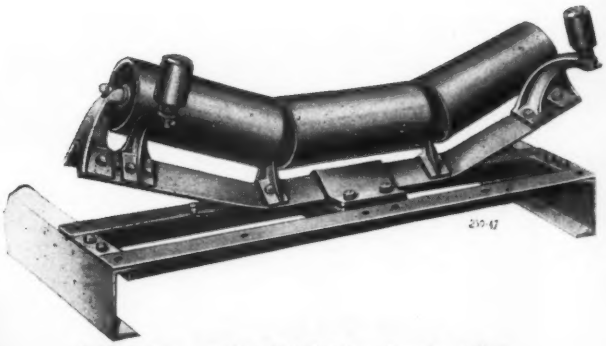
These same engineers are not afraid to suggest innovations i design to better serve your needs. They have made many bi scale, and more often ingenious, applications of Belt Conveyor

Thus, you can be assured of alert, experienced engineering . . . the ability to build carefully and to design for contingencies— prompt deliveries. Put them to work for you.

BELT CONVEYORS

Look again . . note the various types of carrying and return Idlers. A type and size to meet your need exactly. Either ball or roller anti-friction bearings. Sturdily built and designed to provide belt protection — years of operation with minimum maintenance costs.

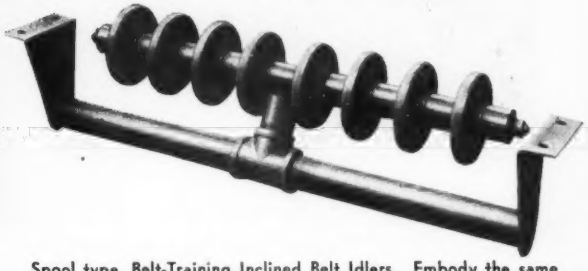




Positive type, pivoted, Belt-Training Carrying Idlers.

Single Roll Belt-Training Return Idlers.

Belt-Training, 2-roll, inclined type Return Idlers. Tilting action of this type Idler makes it very positive in its function.



Spool type, Belt-Training Inclined Belt Idlers. Embody the same principles of operation as the 2-roll type (above) but also provides belt-cleaning action. No build up of material on either spools or belt.

Under each type of Idler shown you will find its description and characteristics. Read them carefully. In addition, Catalog No. 785 is available for more information. It covers our complete line of Belt Conveyors as well as Idlers, Trippers, Pulleys, Take-ups, etc. Send for it today.

THE JEFFREY MANUFACTURING COMPANY Established 1877

958 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2 · Beckley, W. Va. · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 15 · Denver 2 · Detroit 13 · Forty Fort, Pa. · Harlan, Ky. · Houston 2 · Jacksonville 2 · Milwaukee 2 · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 1 · Salt Lake City 1

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

NEW

THE WORLD'S BIGGEST LOADING SHOVEL

MARION 191-M
10 cubic yards

- Loads trucks in the 50-ton class in 3 or 4 passes to meet big haulage problems.
- Big enough to load gondola rail cars quickly.
- Greater travel speed and maneuverability than most of smaller machines.
- All-electric or diesel electric power; Ward-Leonard control on both.
- A 10 cu. yd. heavy-duty shovel with small-machine cycle time.
- Largest two-belt crawler shovel built.

MARION POWER SHOVEL CO.
MARION, OHIO, U. S. A.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

from 3/4 cu. yd. to 65 cu. yds.

Cuts and loads 2 tons a minute with help of 86 TIMKEN® bearings

THIS Lee-Norse "Miner" will cut a 9½′ seam 12½′ wide. It is 47″ high and 8′ wide collapsed. It cuts and loads coal at the rate of 2 tons a minute. To maintain this output—day in, day out—time-out for maintenance and repairs must be held to a minimum.

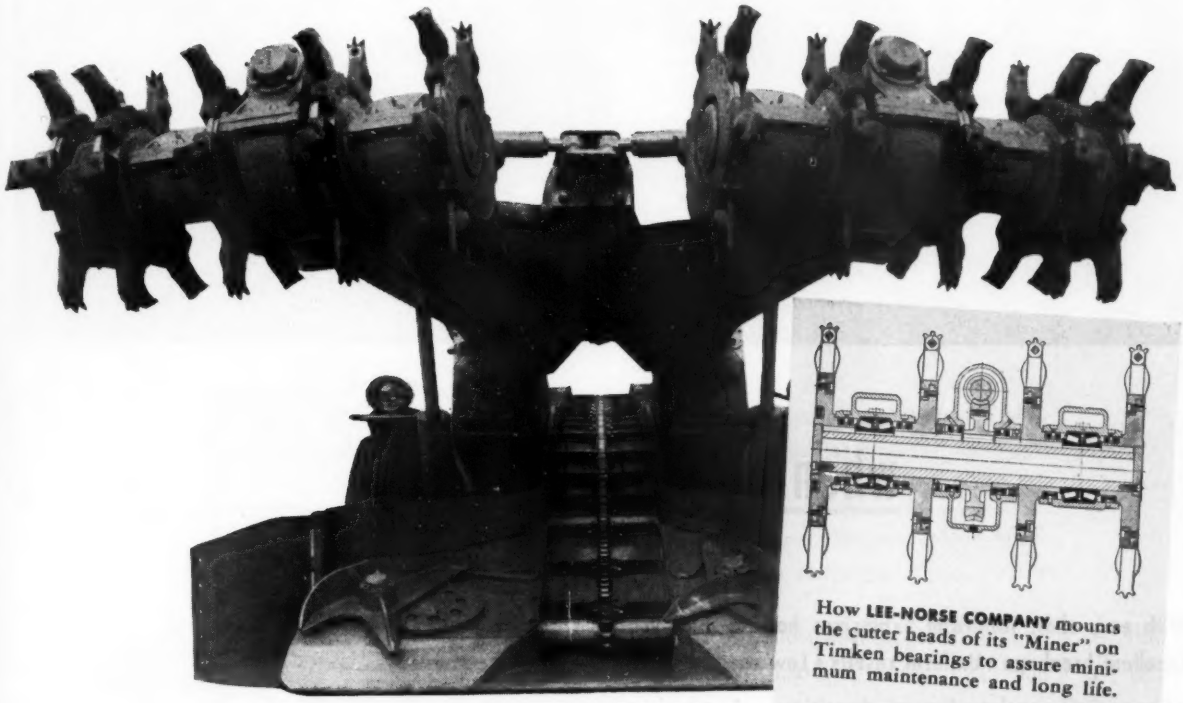
One important way Lee-Norse Company builds trouble-free performance into its "Miner" is by using a total of 86 Timken® tapered roller bearings in the cutter heads and on vital shafts throughout the machine.

Timken tapered roller bearings have exceptional load carrying capacity because of line contact between rollers and races. They withstand the heavy shock loads which occur during cutting operations.

Timken bearings keep housing and shaft concentric, make closures more effective. Lubricant stays in, reducing maintenance. Dirt stays out, reducing wear. Since they take radial and thrust loads in any combination, Timken bearings hold shafts in rigid, positive alignment, insuring proper gear meshing at all times.

Timken bearings give you more advantages than any other bearing. Make sure they are in the equipment you buy or build. Look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **LEE-NORSE COMPANY** mounts the cutter heads of its "Miner" on Timken bearings to assure minimum maintenance and long life.

FINISHED TO CLOSER TOLERANCES

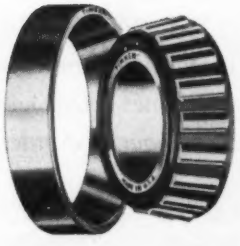
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

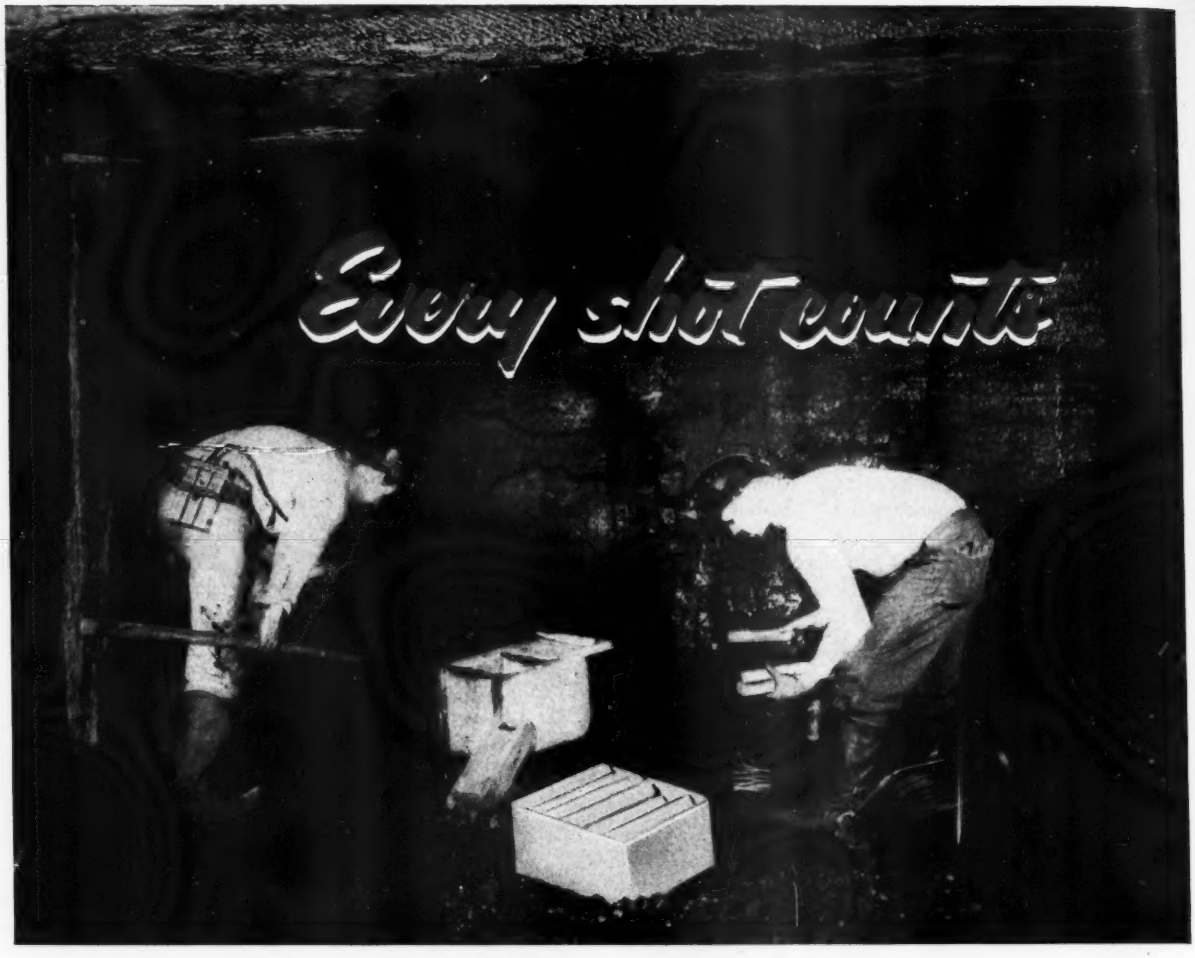
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION



when you use

AMERICAN CYANAMID COMPANY
EXPLOSIVES

With each shot, American Explosives help to give you:
Excellent breakage • Uniform results • Low cost operation

There is a complete line of densities and velocities suitable for producing good results in any seam of coal—with either hand or mechanical loading.

For prompt delivery of these reliable explosives, contact any one of several plants and distributing magazines conveniently located in strategic areas... *make your next order American.*

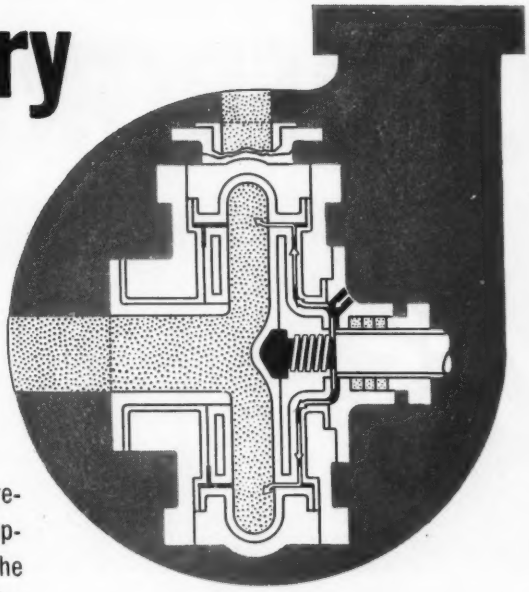
Capable Field Engineers are Available at Your Call

High Explosives • Permissibles • Blasting Powder • Blasting Accessories

AMERICAN Cyanamid COMPANY
Explosives Department
30 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.

Sales Offices: Pittsburgh, Pa., Bluefield, W. Va., Scranton, Pa.
Chicago, Ill., Pottsville, Pa., Maynard, Mass.

The Inside Story OF PUMP ECONOMY



Million-ton-plus performance on harsh abrasives, with no appreciable loss in efficiency, capacity, or head . . . low power consumption . . . simple, inexpensive maintenance. Here are some of the design features of Hydroseals that make these results possible:

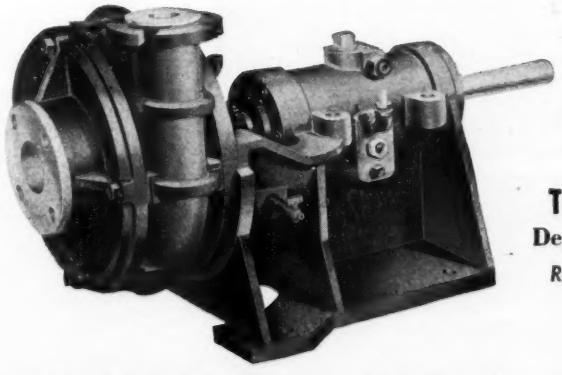
High Efficiency—Clear sealing water protects close clearances from abrasive wear. Initial high efficiencies are thus maintained throughout pump life. No adjustments, take-up, speed changes, etc., are necessary.

Power Savings—Maintained efficiency means that you don't need to install an oversize pump and motor in order to allow for wear. Power costs are reduced as much as ⅓ to ½.

Long Life—Abrasives bounce off the super-tough Maximix Rubber Parts, which outlast metal 4 to 6 times or more. Special alloys are used for coarse material service. Heavy-duty, anti-friction radial and thrust bearings are standard.

Easy Maintenance—All Maximix Rubber Parts are moulded to shape and are mechanically locked into correct position . . . no cementing or vulcanizing is needed. Your own men can make any repairs quickly in the field.

Low Cost Replacements—Besides being low in cost, Maximix Rubber Parts weigh 80% less than equivalent metal parts . . . easy to handle, inexpensive to ship.



Compare these advantages with those of any other abrasives-handling pumps, and you'll see why so many milling engineers like to have Hydroseals working for them. Write for Catalog No. 451.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. K—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives in Most Principal Cities

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

UNDERGROUND, OR . . . .

IT'S JOY EQUIPMENT

Right: The Joy Drillmobile, a twin-boom, self-propelled, highly maneuverable machine, gives you maximum footage at least cost per foot of hole. Features Joy Hydro Drill Jibs for fast, accurate hole-positioning, and remote control.

Above: For high-production loading and haulage of rock and ore, Joy teams of trackless loaders and electric or diesel shuttle cars get the call underground.

Right: Complete range of Joy Stopers includes the new S-91T, with telescopic feed. Requires fewer steel changes, gives more time for drilling.

Below: Joy Wagon Drill specially adapted to drill at any height from toe-holes to horizontals 9' high.

Left: The Joy HS-15 high speed drill for underground blast holes, or core drilling to 500'. Compact and easy handling, with "in-line" vibrationless drive.

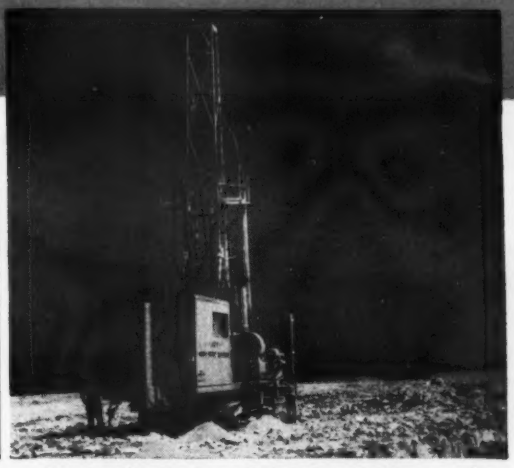
Below: Joy Hydro Drill Jibs are versatile units; can be mounted as required to suit individual needs. This truck-mounted Jib is an example.

. . . ON THE SURFACE

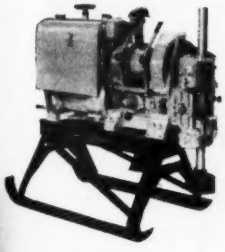
FOR GREATER TONNAGE FOR LOWER COSTS

Above: Joy builds a complete line of "Silver Streak" Hand Tools, cadmium-plated for rust protection and easier running in.

Above: Joy Wagon Drills (Medium and Lightweight models) are easily maneuvered units with positive locking brakes for quick set-ups and balanced drilling on any terrain.



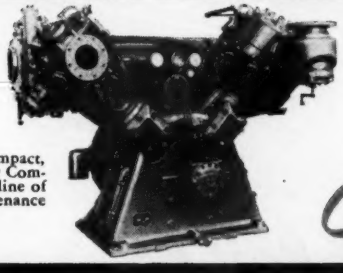
Above: Joy Champion Rotary Drills set absolutely new standards in high-speed, economical blast hole drilling, far outperforming all others. Built in two self-propelled models, for diesel, gasoline engine or electric motor drive.



Above: Joy Core Drills range in capacity from 250 to 1750 feet of 1½" hole. Screw feed or hydraulic types—gasoline, diesel, air or electric drive.

Left above: Joy's popular Series 80 Portable Compressors, with the famous "Econo-Miser" load control, are built in seven sizes, from 60 to 630 CFM.

Above: Joy Hydro Drill Jibs are readily adaptable to truck-mounting, etc. for secondary drilling or toe-holes in quarries or open-cut mining.



Right: Joy pioneered the compact, modern "package-type" Air Compressor—offers a complete line of highly efficient, low maintenance airplants up to 3656 CFM.

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WAD M-3263

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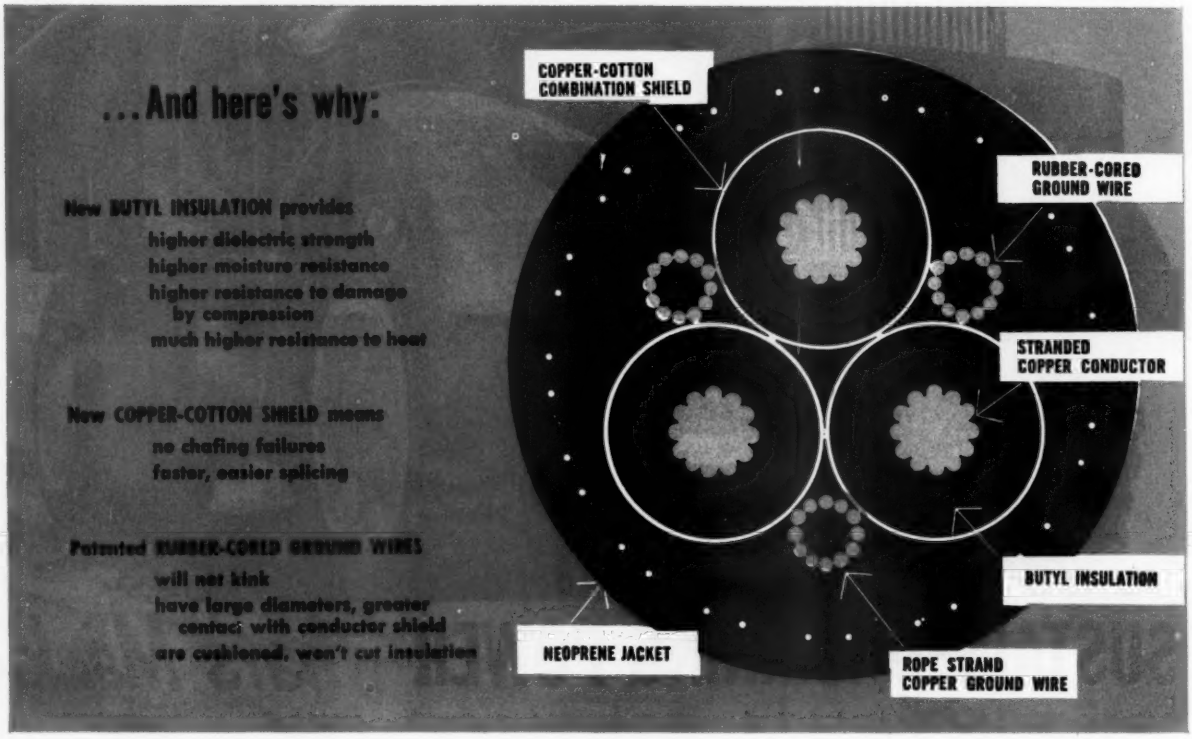

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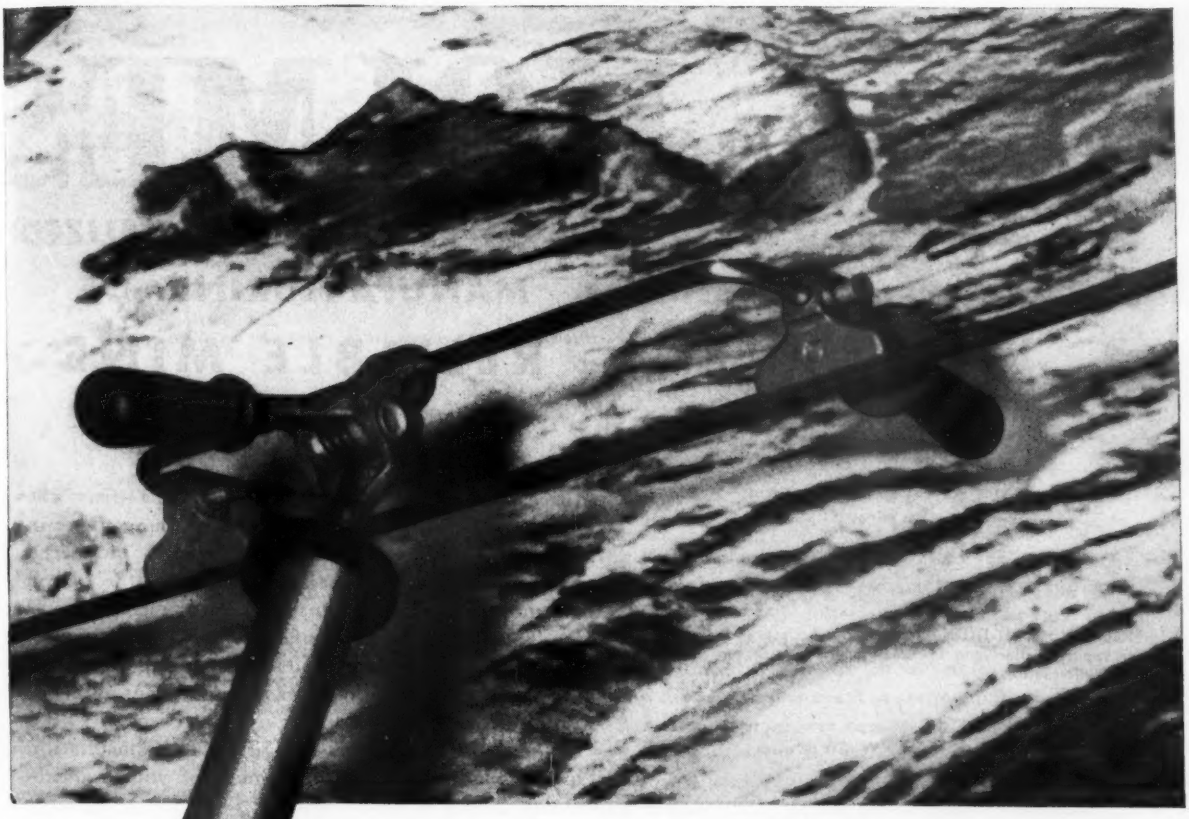
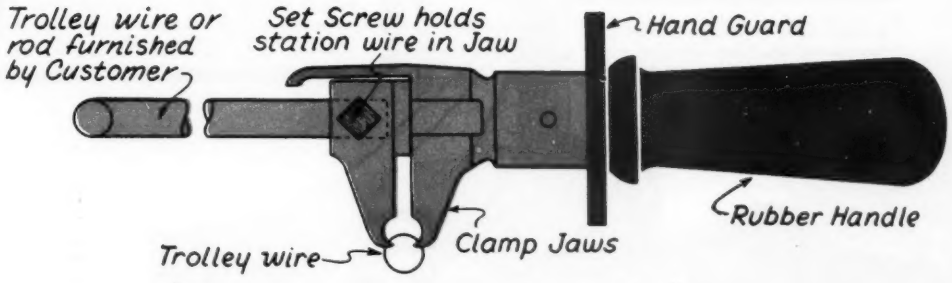


4287-M

TAP STATION
Keeps trolley wire clear



Get fused taps off of the trolley wire, out of the current collector path, with Trolley Tap Stations like this. Made with O-B Clamp-Type Contacts and a length of trolley wire or rod, the station is easily clamped wherever it is needed. Current collectors pass the station without interruption of current going to the locomotive or to equipment served by the taps.

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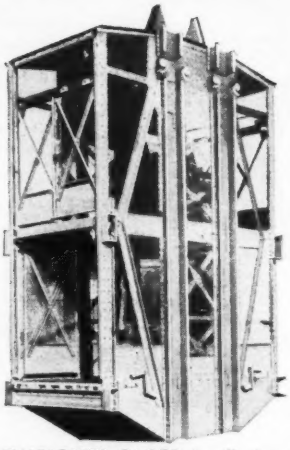

HOLMES HEAVY-DUTY CAGES in all sizes and types for rapid hoisting and low maintenance. Ask for complete information.

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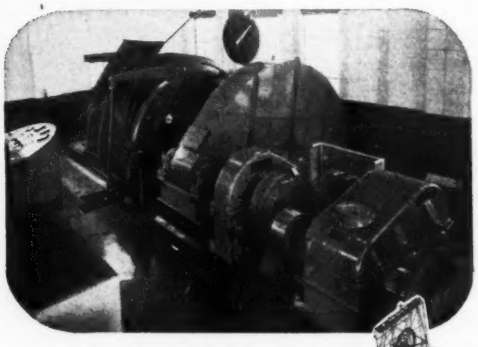

Holmes Advance Design Hoists feature the latest and most complete control equipment. Ask for complete information.

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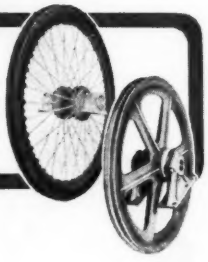
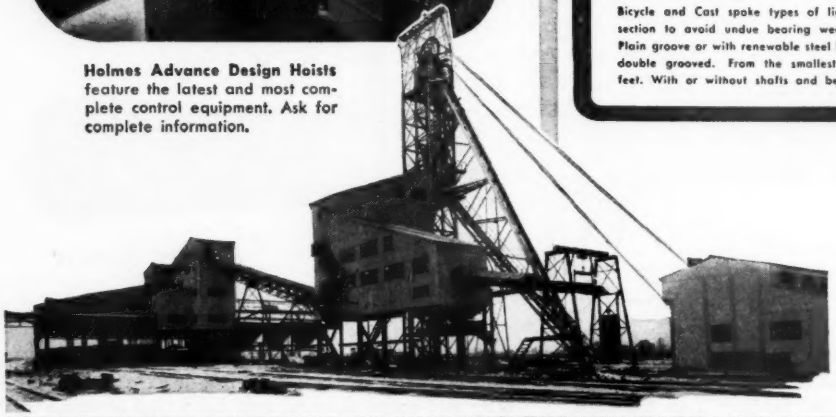
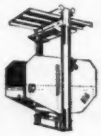




Peabody Coal Company's new mine No. 17 at Pana, Illinois, is equipped with Holmes Hoisting Equipment.

SHEAVES

TIPPLE EQUIPMENT



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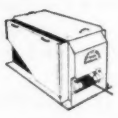
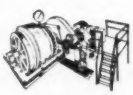
SKIPS

LOWERING SPIRALS



CAR PULLERS AND RETARDERS

LABORATORY CRUSHERS



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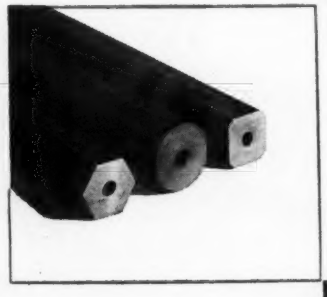
Insure the quality of your job—cut costs—use Crucible Hollow Drill Steel.



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(Patent Applied For)

- *FASTER DUMPING*
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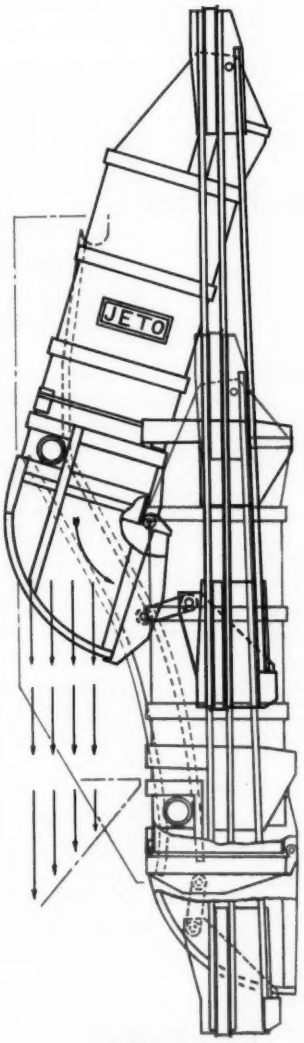
- *LIGHTER, LOWER HEADFRAME*



Black lines in diagram show skip in open, or dumping, position. Red lines show closed position.

BRAND-SPANKING new, the Lake Shore "JETO" Bottom Dump Skip employs a new patented principle that brings extra speed and economy to mining operations. The "JETO" doesn't tip over, resulting in faster dumping as well as less wear and tear on the headframe. Dumping is a smooth vertical and pivot action incorporating special scrolls that guide the skip up and out at a slight angle for positive, faster dumping. The "JETO" makes possible a lighter and lower headframe which means less travel—9 to 12 ft.—for the skip before dumping. Lightweight steel construction throughout assures you of less dead load, higher payload. Specifications are tailored to your operations. Write for full details today.

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Editorials

Volume 38 JOHN C. FOX, Editor February, 1952

Facing the Future

ON THE following pages is proudly presented the record of the Domestic Mining Industry in 1951. It is a record to instill pride in every American. In a year fraught with the danger of all-out war, marked by shortages in manpower and vital materials, rising operating costs and further depreciation of the dollar, the mining men of this country have wrought remarkably well.

In the face of increasingly difficult mining conditions and reserves seriously depleted by two World Wars, the iron ore industry produced 115,000,000 gross tons—a new record. The coal producers continued to answer all calls for fuel and chemical raw materials with a production in 1951 of over 535,000,000 tons of bituminous coal and 39,500,000 tons of anthracite. This was enough to supply all domestic needs and still ship all the coal to Europe for which bottoms were available.

Copper producers continued to expand facilities and open new mines so that by 1954 or 1955 225,000 tons will be added to the annual supply. Aluminum production is likewise being expanded and when present plans are implemented will have been increased by 90 percent.

Zinc and lead production though still short of requirements came to nearly 700,000 and 400,000 tons of primary mine output, respectively. With the new facilities and expanded operations planned there is every reason to hope that supply and demand will be in balance in the not too distant future.

Tungsten output took a remarkable upward leap even though, with the restoration of normal world trade, domestic operations may be forced to close down again.

This story of progress is repeated over and over again for the many other mineral products so vitally important to the defense of the western world and the maintenance of our standard of living.

There is not sufficient space on this page to recount all the advances realized in 1951 and those planned for the months and years ahead. Let it suffice to say that the United States came out of the crucible a much stronger nation than it was at the start of the year.

Many challenging problems still remain to be solved but the combination of progressive thinking, painstaking experimentation and indomitable determination that characterize the American Mining Man will be equal to the challenge.

Mining can face its future with confidence.

Scrap It Now

SEVERAL months ago, on this page, we pointed out that scrap is vital to steel making and thus to the entire defense program. A systematic program for the discovery of dormant scrap in and around mines and plants was advocated.

Since that time tremendous strides have been made in the scrap drive. But in spite of all that has been done, there is still not enough to keep the furnaces going. Five open hearth steel furnaces closed down on January 4. Three halted operations earlier that week and additional shut downs are predicted.

Continued lack of scrap could well cause the cutting off of 5 to 10 percent of our steel production. This would mean drastic steel cut-backs all along the line and less steel for allocation under CMP.

There is an equally critical shortage of nonferrous scrap—particularly copper, brass, bronze, aluminum, lead and zinc. On the solution of the scrap recovery problem depends the very success of the defense production program.

Every effort must be made to seek out and return to use each pound of idle metal, no matter where it may now be lying; no matter how insignificant its quantity may appear.

The machinery for a successful ferrous scrap drive was suggested before. The official charged with inspection of the mine and plant should now redouble his efforts and turn up the nonferrous material too. He should be ruthless in his estimation of what is and what is not scrap. Unless there is good reason to expect it will be used—away with it.

Scrap recovery should be placed on a continuous basis. Once a month is not too often to make an inspection, and the rooting out of every questionable piece of machinery or obsolete replacement part will pay off in greater safety, reduce taxes through inventory write-off, give lower insurance rates and result in better housekeeping.

MINING in Review

• STEPHEN W. WOOD has been associated with manpower needs and uses since 1934. He has given us the benefit of his intimate knowledge of the manpower situation in a review which begins on page 40.

• MAX H. FORRESTER is vice-president of The Pittsburgh Consolidation Coal Co. He has long been associated with advanced thinking in coal mining and is well suited to write about progress in mechanical coal mining. His timely review starts on page 43.

• WALTER A. WECKER, president of Marquette Cement Manufacturing Co., has a background of 38 years in the cement business. A native of Peru, Ill., he joined Marquette in 1914 as a clerk at its Oglesby, Ill., plant. Following military service in World War I he returned to the company as credit manager in its Chicago office, rapidly rose through the ranks to become an officer of the company in 1921 and president in 1933. His review of the cement industry appears on page 49.

• Advances in Milling Practice, is reviewed by NATHAN ARBITER, Associate Professor, Division of Mineral Engineering, School of Mines, Columbia University. Before joining the Columbia faculty he was research metallurgist with Phelps Dodge Corp. (1944-1951), and on the staff of Battelle Memorial Institute (1943-44). He spent five years at Columbia in research work with A. F. Taggart. His up-to-the-minute article begins on page 52.

• CHARLES DORRANCE, Senior Mining Consultant, Stevenson, Jordan and Harrison, called on a lifetime of experience to write the article on Coal Economics, beginning on page 55. Between 1931 and 1937 he was one of the leaders in the attempt to stabilize the anthracite industry. In 1937 he began managing bituminous coal properties, retiring as chairman of the board of West Virginia Coal and Coke Corp. early in 1951, when he joined his present firm.

• OTTO HERRES, vice-president, Combined Metals Reduction Co., is the author of the article on lead and zinc. Mr. Herres is a graduate of the Colorado School of Mines and has worked at mining jobs in the west from miner to that of his present position. His experience in Washington enables him to speak with authority in his review starting on page 59.

• HORACE M. ALBRIGHT, president U. S. Potash Co., joined that company in 1933. Previously he had been Director of the National Parks Service and is an active conservationist. He is a director of the American Mining Congress, and chairman of the National Minerals Advisory Council. His review on Potash appears on page 62.

• J. J. FORBES has long been in the forefront of the fight to make mining safer. He has held many responsible positions during 37 years with the U. S. Bureau of Mines. Under his supervision, more than 1,000,000 men have been trained in first-aid methods. One of his first acts as the new director of the Bureau was to author the safety review beginning on page 66.

• DAVIS READ started to work in the coal fields at the age of 16 while still attending high school. He recently retired as chief engineer for the West Kentucky Coal Co. and entered the consulting field. We are glad to have Mr. Read's review of strip mining 1951, which begins on page 70.

• The subject of exploration and geology has been ably covered for our readers by CHARLES H. BEHRE, JR., professor of geology, Columbia University. Professor Behre's experience in geology has been wide and varied. He has taught at several universities and was mineral adviser to the government of Burma, geologist on many important surveys and has done consulting geologic work all over the world. He draws upon this wide knowledge of the field in his review article beginning on page 74.

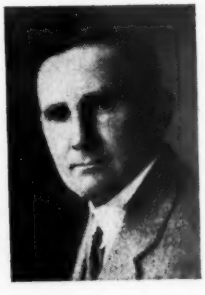
• The copper situation is reviewed by TOM LYON, Defense Materials Procurement Agency. His long association with western copper producers and his present position gives him the insight reflected in his review on the status of this important commodity. The review begins on page 77.

• The tungsten, mercury and chrome picture has been painted by IRA B. JORALEMON on page 78. Mr. Joralemon has been a practicing engineer and geologist since 1907. He consulted on many important metal mining developments in the west and his book, "Romantic Copper," is a classic in its field.

• Coal transportation is the topic on which A. J. OPPERMAN, consulting engineer of Uniontown, Pa., has written. Mr. Opperman's connection with the coal industry began in 1915 when he joined the staff of H. L. Burchinal, a mining engineer. In 1936 Mr. Burchinal died and Mr. Opperman took over the business and has since conducted his own private consulting service. The transportation review begins on page 84.

• LAWRENCE LITCHFIELD, JR., vice-president, Aluminum Co. of America, reviews the aluminum and magnesium situation for readers of "Mining Congress Journal." Mr. Litchfield has been with Alcoa Mining Co. since 1925 and has authored several articles for the technical press on bauxite. His review of the aluminum and magnesium situation begins on page 86.

• RUDOLPH T. ELSTAD is president of the Oliver Iron Mining Co. He joined the company in 1919 as a mining engineer and rose through the ranks to the presidency of Oliver in 1946. Long in intimate contact with the iron mining industry, he has drawn upon his broad knowledge to write the review which begins on page 88.



• JAMES A. BARR, Requirements Division, Defense Minerals Administration, author of several articles on phosphate and potash, and one time chief engineer of International Minerals and Chemical Corp., brings us up to date in an extra-curricular report on the phosphate situation beginning on page 102.

H. W. Nelson

A. C. Richardson

• Three men have united to bring our readers a review of bituminous coal research. DR. HARLAN W. NELSON, a supervisory engineer in fuels and combustion research at Battelle Institute has been associated with much of Battelle's research on stokers, coal gasification, and combustion phenomena. A. C. RICHARDSON is supervisor at Battelle of the work on ore dressing and coal preparation. He is the author of numerous publications on materials beneficiation. The third co-author, RICHARD B. ENGDAHL, is supervisor of fuels and combustion research at Battelle. He has been active in Battelle's research on th industrial and locomotive utilization of fuels on which he has been the author of numerous publications. Their comprehensive summation of current bituminous coal research begins on page 98.

R. B. Engdahl

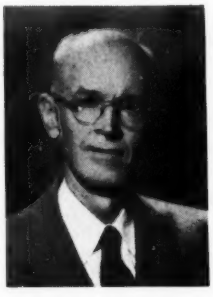
• HON. PAT McCARRAN, Senator from Nevada, the Silver State, again contributes a splendid report on silver. His complete familiarity with the silver situation makes him particularly well fitted to review that topic. His review appears on page 107.

• ROBERT W. BACHELOR has authored numerous articles on banking, finance, money and investments. Head of the Research Department, A. M. Kidder and Co., member of the New York Stock Exchange, director of research, The Bay Foundation and director of American Export Lines, Inc., and a recognized authority on gold and money, he contributes the gold review which begins on page 109.

• EVAN EVANS has been connected with the anthracite industry for many years. He is now president of the Lehigh Navigation Coal Co. His comprehensive review of anthracite begins on page 111.

• Experience of JAMES E. LARKIN in ferrous scrap dates back to 1942. Since 1946 he has been with the Bureau of Mines supervising statistical canvasses covering consumption and inventories of iron and steel scrap and pig iron. His review of ferrous scrap in 1951 begins on page 115.

• ARCHIE J. McDERMID is a graduate of the Minnesota School of Mines. He spent a number of years as a mining engineer in western underground mines and was, for part of that time, Arizona correspondent for two mining magazines. Since 1943 he has been a commodity specialist on nonferrous scrap metals for the U. S. Bureau of Mines. His review of the nonferrous scrap situation begins on page 117.



• JOSEPH L. GILLSON is geologist for E. I. duPont deNemours & Co., Inc. In the course of his work he travels far and wide and sees at first hand the mining of many of the commodities about which he writes. His analysis of the industrial minerals situation appears on page 134.

Carel Robinson

• CAREL ROBINSON and LEE J. SMITH discuss Progress in Coal Preparation in an article on page 119. They have both done considerable consulting work for coal mining companies in and out of this country and present a concise review in their article.

Lee J. Smith

H. J. Broughton

Leland H. Johnson

• A review of roofbolting developments begins on page 124. H. J. BROUGHTON and LELAND H. JOHNSON, assistant chief engineers, Tennessee Coal and Iron Division, U. S. Steel Co., had charge of roof bolting experiments and studies in T. C. I.'s metal and coal mines and know well whereof they write.

• The annual review of sales of mechanical loading and cleaning equipment is presented through the courtesy of U.S.B.M. by DR. W. H. YOUNG and DR. R. L. ANDERSON, respectively, chief Bituminous Coal Section and Engineer Economist. This article on page 131 provides a measure of the new facilities for production of the nation's prime source of energy.

To maintain maximum working forces of skilled metal miners is a prime requisite in the defense effort

Manpower

Selective Hiring will Help Solve the Problem of Migrating Workers

By STEPHEN W. WOOD
Manpower Branch, Mining Requirements Division
Defense Materials Procurement Agency

THE metal mining industry experienced some manpower shortages during 1951 but no acute widespread labor deficit developed. Some irretrievable production was lost, because of stoppages. Failure to maintain maximum working forces in those mines with the least attractive working and living conditions also affected production—particularly in the northwest. The traditional exodus of workers from this area occurred in the spring as construction, lumbering, and agriculture attracted the transient mine element with higher wages and better living and working conditions.

By the close of 1951 this situation reversed itself, as usual, and most mines had adequate manpower. One major copper producer required several hundred additional men for an expansion program and a few smaller operators needed small numbers of workers. Generally, however, the manpower situation in the mines was fairly comfortable and no shortage existed that could not be met by aggressive, realistic action.

Military Cooperated

During 1951, the military services made no very serious inroads on the metal mining industry's manpower. Selective Service Boards, generally speaking, took seriously the inclusion of the occupation of *Metal Miner* on the the Labor Department's List of Critical Occupations and few miners were drafted. The recall to duty of Reservists and National Guardsmen presented a different problem since many key employes of the industry had special qualifications, valuable to the miiltary, as the result of previous service, or training and education at Government expense. On the whole, however, the military branches were exceptionally conscious of the importance of key personnel to the industry. Upon the joint request of employers and the Manpower Branch of the Defense Minerals Administration (now Defense Materials Procurement Agency), military reactivation was delayed in a high percentage of cases. In fact, out of more than one thousand such requests and appeals, the military services denied delays or outright discharges in only two cases.

This fairly comfortable picture, based upon 1951 experience, is apt to be misleading unless we look a little farther ahead. Good reasons for pessimism as to *future* labor supply came to light recently when a projection of manpower requirements, based upon proposed production programs, was made. This study revealed a need to attract several thousand additional workers to the metal mining industry if production goals are to be met. For example, it was estimated that increased copper production between now and 1955 will require 5000 additional workers. Lead-zinc production goals will require 4000 additional workers during the same period of time. Most of the increased manpower will be required within the next 12 months and exploration projects will demand additional labor at the same time.

See No Labor Surplus

As general defense production is expanded, it can be expected that the domestic labor market will become increasingly tight. There is no substantial labor surplus now and none can be anticipated. Some industries can find solution to their manpower shortages through the return to the labor market of women, older workers, and other marginal types of labor supply. Unfortunately, metal mining is not an

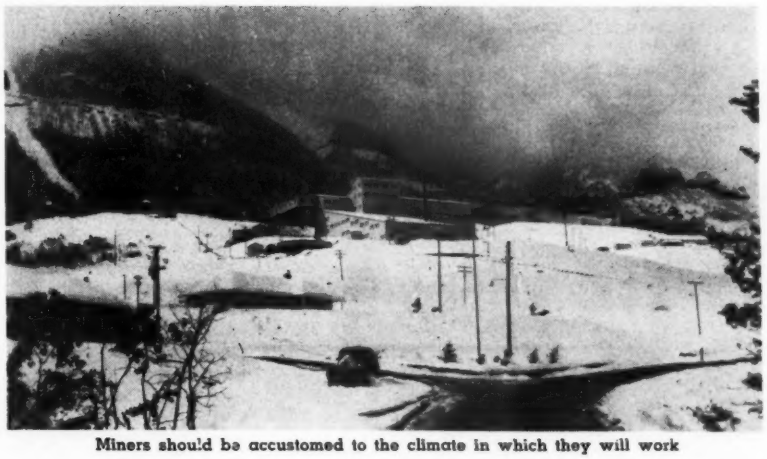
industry that can easily utilize these marginal types. Able-bodied male workers, preferably with some degree of skill and experience in underground employment, represent the ideal answer to the manpower problem that we face, or that may develop, in the next few months. However, it is strictly wishful thinking to assume that this ideal type of worker will be abundantly available in the face of increasing labor requirements by other industries.

In 1952 it is safe to predict that the difficulty of securing the additional workers required will increase greatly. The problem of retaining the industry's present personnel will be intensified because of keener competition both from the miiltary and from other industries. However, efforts both to retain present personnel, and to attract new workers to the mining industry, will be essential if we are to keep abreast of production schedules for national defense.

If the present procedure for retaining adequate manpower in the mining industry breaks down, blanket deferment of workers in certain critical occupations may be required. This would represent a drastic step, and under present conditions it would be exceedingly difficult to prove a case that would justify blanket deferments in even the most critical mining jobs. In the meantime, it is important that efforts to prevent excessive military withdrawals should be continued under existing procedures, which involve requests for deferments and for delays in recall made jointly by employers and their claimant agency in Government.

Better to Keep Workers

Means of retaining present employes should be explored. Working and living conditions should be improved, if they are in any way deficient, since these things are often more important to the worker and his family than the amount of money he is paid. However, if wage rates are inadequate the possibility of increasing them should not be overlooked.

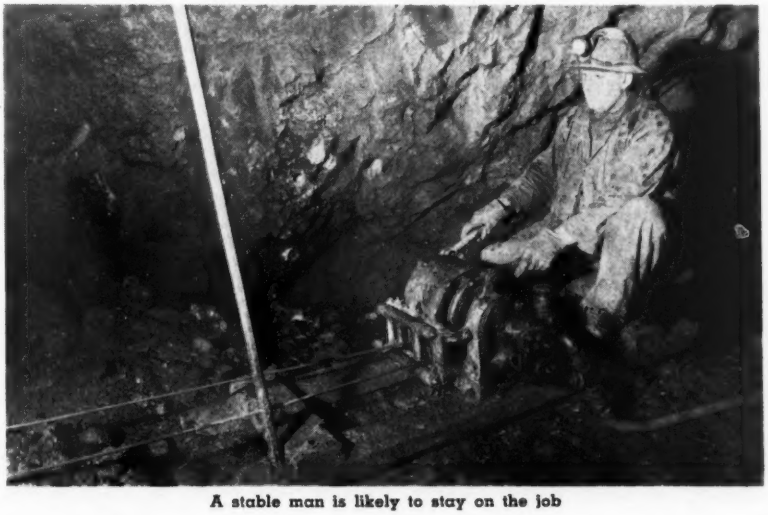


Miners should be accustomed to the climate in which they will work

The industry has long recognized that some degree of out-migration of workers, to accept more attractive employment, will occur each spring. This is particularly true in the northwestern states where the industry invariably suffers serious manpower losses. Some thought has been given to curing this seasonal exodus, but a lot more thought *should be* devoted to this problem. Why should the mining industry resign itself to this industrial disease? There must be some medicine that will cure it, substantially, if not completely. Perhaps it would help to stress the fact, to the miners themselves, that they are better off, in the long run, to retain steady jobs in a permanent, year-round industry than to skip seasonally to temporary jobs. Convincing workers to keep jobs, in the face of attractions offered by other employment, is not easy. It is equally certain, however, that this, and all other possible expedients, must be resorted to if we are to avoid a repetition of the seasonal exodus that has occurred in the past.

To increase the industry's labor force, recruitment efforts should be intensified. Occupational standards should be lowered as much as possible and inexperienced workers, not normally acceptable to the industry, will almost certainly have to be utilized and trained in sizeable numbers. The U. S. Employment Service is fully conscious of the importance of increasing and stabilizing employment in the metals production industry. The cooperation and assistance of this organization should be sought through their operating facilities and local offices in each state.

A very important adjunct, however, is the availability of suitable housing for workers and their families. In the absence of such housing, only the unstable, floating type of worker can be expected to respond even to the most attractive recruitment devices. A recent survey conducted by the Department of Labor reported labor shortages at a number of mines with far too frequent comments that, according to the employer, adequate housing was not available.



A stable man is likely to stay on the job

Recruit Only Stable Men

The long-range answer to increasing the working force of all mines lies in the development of adequate family housing and the pursuit of a highly selective recruitment program, designed to attract only those workers most likely to remain on their jobs, and to become permanent residents of the community. The mining industry must recognize that this is true and do something about it. There is no lasting benefit to production through the hiring of workers who remain on their jobs for only a few days. There is lasting benefit, however, if recruitment efforts result in the employment of stable men who will join the community, with their families, and re-

main there. Experience has shown that workers, accustomed to the climate and weather conditions existing at the location of the job, are more inclined to remain than those who are not.

This suggests the adoption of a different hiring approach and a revised concept of recruitment when attempts are made to secure workers from outside the local area. Ordinarily, when hiring agents undertake recruitment of labor beyond the local area, their objective is, largely, to hire as many workers as possible, as quickly as possible, without much consideration of the factors that make for a stabilized work force. This approach too often disregards six basic questions—

(1) Is the man being interviewed familiar with the living and working conditions at the location of the job—does he know what he is getting into?

(2) Does he fully understand that he is being interviewed for a *permanent* job and that the employer is not interested in fly-by-night help?

(3) Is he a stable man likely to stay on a job? Does his work history bear this out?

(4) Does he intend to move his family and plan to become a part of a new community, with full knowledge of what such a transfer involves?

(5) Will he be able to get along under new climate conditions, if such prevail?

(6) Will he be satisfied, and economically self-sufficient, at the wages he will receive?

If there is reason to believe that the answer to any of the above is negative, the applicant should then become a questionable risk. The employer's investment in him is probably not justified and the man's contribution to maximum production, if hired, would be dubious.

If an applicant does measure up affirmatively in terms of these six questions, he represents a worthwhile risk and is, potentially, the sort of man the recruiter should hire. It is far better to secure one such worker per day than 10 floaters who, in the near future, may be expected to show up in the employer's turnover statistics. Only wasted money and lost production can result from hiring transient-type workers.

Selective Approach Needed

Admittedly, this more selective approach to the recruitment of workers requires more time and the hiring agent will need to be fully competent to insure that hiring commitments are made only to those persons that measure up to these fairly high standards. The hiring agent should explain fully to all applicants the working and living conditions and other employment factors which the six basic questions involve. Having done so, he should take as much time as is necessary to satisfy himself that the worker is truly interested in a permanent transfer to the proposed location of employment. Each recruiter should fully understand that his employer's interest is in securing smaller numbers of stable workers, rather than large numbers of the transient type. Development of this more selective recruitment concept should not be delayed—the sooner it is adopted, the sooner will increased stabilization of employment in the metal mines be attained.

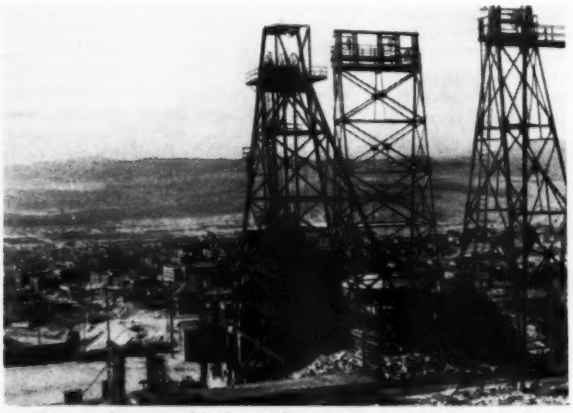
Untapped Manpower

Recently, a few mines have experimented with some success in the utilization of Indian workers. One mine in Colorado is reported to be using Indians successfully underground, while another reports that their brief experience with Indians, thus far, appears promising. There seems no good reason that would preclude the broader use of Indians, both underground and on surface jobs. These people are to be found in large numbers on western reservations. The industry could do far worse than to devote some time and training attention to Indians with the anticipated result of their fuller adaption to mining jobs. The Bureau of Indian Affairs is ready and available to assist and cooperate in such a project.

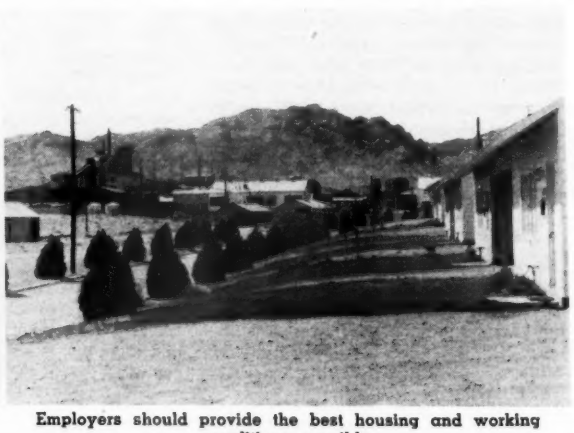
Utilization of workers from European countries has been considered from time to time. Other industries have benefited from the importation of foreign workers and it may be that the metal mining industry should give more favorable consideration and support to this idea. There is no reason why mining should not again resort to European workers to build up its working forces. It was done years ago with a degree of success that is now a matter of historical record. More recently, Canada virtually solved its serious manpower shortage by bringing more than 5000 Europeans into the Canadian metal mines. It has been done before and may need to be done again.

Some of the things mentioned as possible remedies for the manpower shortage that may develop in 1952 and in future years may seem unusual. However, in order to achieve the metals production that this country requires, it may be necessary to resort to such unusual things.

In 1952, to avoid a serious manpower shortage and a resultant loss in important production, attempts must be made to (1) avoid the loss of present working forces; and (2) expand personnel, as necessary, to meet production schedules. In connection with both, the things being done now must be done better and faster; in addition, other feasible methods should be adopted, even if they represent great departure from "business as usual." If the industry and the Government work together, and adjust to conditions quickly as they become more critical, there need be no manpower shortage that can't be solved; 1952 need not be a bad year on the manpower front.

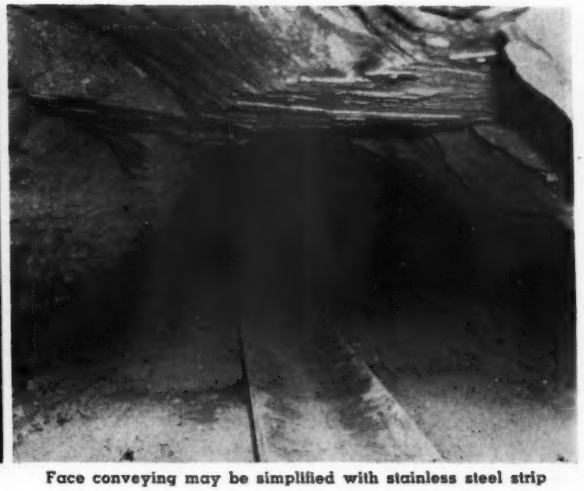


New workers should plan to become part of the community



Employers should provide the best housing and working conditions possible

New models marked progress of continuous mining



Face conveying may be simplified with stainless steel strip

Mechanical Coal Mining

Progress in Coal Mine Machinery Design Resulted in Greater Production, Safety and Economy

By M. H. FORESTER
Vice-President
Pittsburgh Consolidation Coal Co.

COMPETITIVE factors and their effect on profit margins have spotlighted more brilliantly than ever the urgent need for cost reduction throughout the industry. More mechanization, new methods and a desire to emulate the assembly line economies of the mass production industries pervaded the thinking and planning of mine managers and mining engineers during 1951.

In spite of the handicaps of cheap competitive fuels, notably residual oil from foreign sources, and inadequate railroad car supplies and services, which were more pronounced and prevalent in some areas than in others, annual production increased about 3.5 percent over 1950 to reach a total of 530,000,000 tons. Inability of European countries to supply their own needs in a revived and war-stimulated economy, brought about an unusual demand for export coal during the closing months of the year, causing overseas shipments to surge from 3,000,000 tons in 1950 to 35,000,000 tons in 1951.

A permanent type of organization was established to deal with the industry's labor problems currently at top levels, and contributed much to improved relationships and more stabilized performance. Continuation of a cooperative spirit on the part of management and labor is vital to our efforts to overcome the handicaps which competitive fuels have imposed. In contrast to the general commodity trend, coal prices remained more or less stationary or declined slightly, in spite of the upward spiral of wage and material costs and taxes. Although some benefit will be derived from the granting of an increase in the percentage depletion rate for coal from five percent to 10 percent of gross income, there is a definite urge for substantial cost reduction through radical departure from existing mining methods and principles, both in service and face operation. Research and development is being pushed by producers and manufacturers, individually and jointly with visible progress.

Safety has become such a by-word in the industry, that it dominates the development and acceptance of new ideas. Concentration is the natural basis of mechanization and simplification, but it brings with it both advantages and disadvantages. The latter, being related primarily to safety and health, must be solved first. The United States Bureau of Mines and the various State Mining Departments have cooperated most freely with the industry in working out the solutions to these problems.

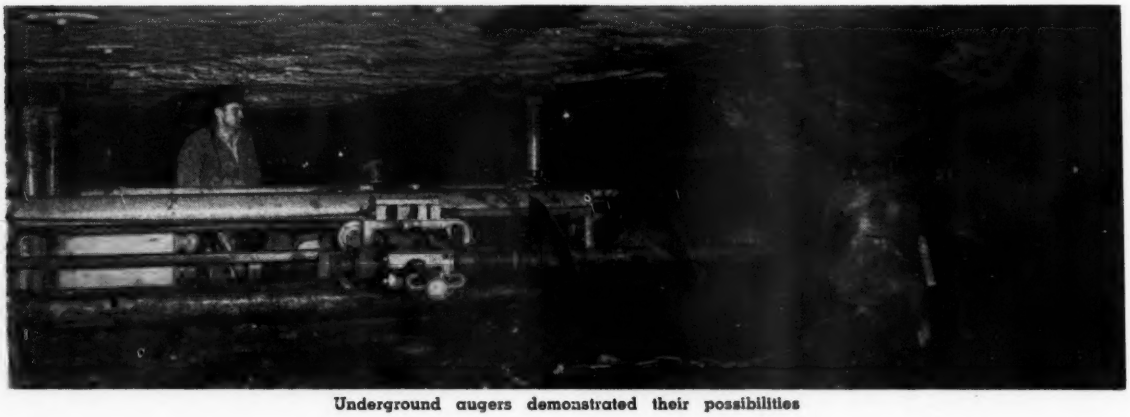
Quality of product is an essential upon which major emphasis must be placed, in order to meet the analytical and size requirements of the consumer, as cost and productivity phases are improved.

Improve Machine Design

The more important developments in equipment and methods of mining during the year appeared in the fields of face extraction, roof support and transportation. Replacement of hand loading with mechanical loading machines continued, but most marked was the shift from track to off-track operation. Conversion of track equipment to rubber tired mounting was widespread and shuttle car sales increased tremendously, in keeping with the unprecedented demand for off-track cutting machines and drills.

The industry's desire to improve its blasting technique saw a notable extension in the use of compressed air for breaking down coal. A new chemico-mechanical device intended to accomplish similar results made its appearance early in 1951 and will no doubt develop more rapidly during 1952.

Wider application of the continuous mining principle moved along rather rapidly with not less than three types of such machines in commercial production, and at least four more expected to reach that stage during 1952. There is as yet no continuity in face operation, which the term continuous mining implies. However, a successful combination of the separate cutting, drilling, blasting and loading operations of the conventional hand or mechanical mining cycle into one operation has already been accomplished. Many problems remain, how-



Underground augers demonstrated their possibilities

ever, and must be solved before the full benefits of combined mining and loading become available to a major percentage of the industry. The total number of continuous type machines working underground in around 90 bituminous coal mines of the U. S. during 1951, increased to around 155, conforming to seven different designs. The chain type element for attacking the solid coal still predominated in the machines in use, but the rotor type element appears to be the choice of the majority of designers. Gradual replacement of the chain principle appears to be under way, brought about by the desire for simplicity of design, reduction in maintenance costs and improvement in size of product. Productive operating time has remained at levels comparable to those experienced with conventional loading machine units. Machine outages due to breakdowns, interruptions for roof support and transportation continue as handicaps to more rapid adoption of this method of mining. Suitable projections for maximum efficiency and continuity of operations for these machines are gradually coming off the drawingboards, and will prove their worth more particularly in the planning and development of new properties.

A production of 8,000,000 tons with continuous type machine is forecast for 1951, and is expected to reach 13,000,000 tons in 1952.

Some thought has been given to the mounting of mining elements on the front end of loading machines, or changing the heads of universal type cutting machines to convert them to combination mining and loading units. Little progress has been made, although the idea has much to appeal to the average coal operator with a sizeable capital investment in conventional mechanized mining equipment.

Attention on Low Seams

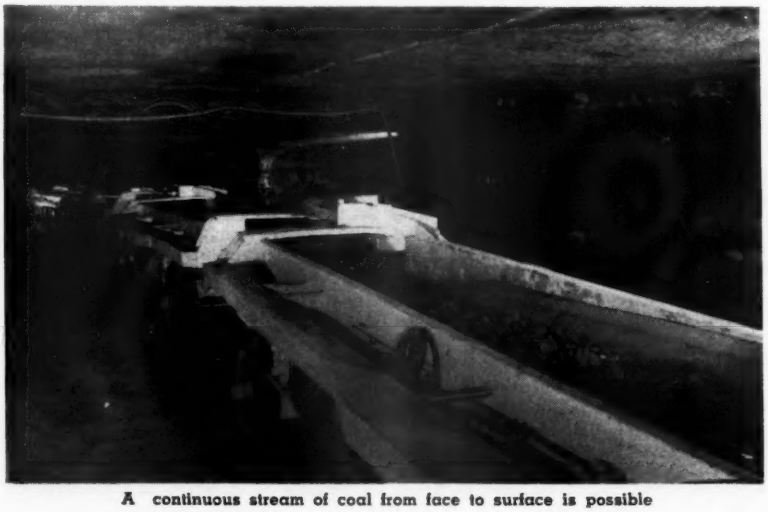
Rapid depletion of the thicker seams, particularly those of metallurgical and by-product qualities, has for the past several years emphasized the need for more suitable equipment for low vein mechanization. Efforts of producer groups and manufacturers to meet this challenge bore some fruit in 1951 with the appearance of new low models of cutting, loading and continuous mining machines and shuttle cars. These followed rather closely the pattern of design originally conceived for thicker seam application.

It is more likely that future low vein mining machines and methods will differ radically from those in use in the thicker seams. Hence, we find a growing tendency to revive longwall mining in a modified form. Borrowing from the experience of foreign countries, notably England and Germany, where longwall mining is standard practice, three types of foreign equipment were installed during the latter part of 1951 in three different eastern mining operations. The Mecco-Moore Cutter Loader and the Samson Stripper, both British, and the Westfalia Rapid Hewer (German), will be called upon to demonstrate their worth to the U. S. Coal Industry in 1952.

Other low vein operators are showing marked interest in the development and use of underground augers, if and when a 50 percent recovery limit can be justified. Experience with large augers to supplement strip coal recovery from highwalls led to limited experimentation underground during 1951. Enough was done to indicate attractive productivity and cost possibilities. Expansion of this idea and extensive field testing is promised for 1952. The use of augers for boring crosscuts and recovering pillars even in higher measures and in conventional mining practice, seems to offer definite practical values.

Advances in Roof Control

Roof bolting continued its march of progress throughout all mining regions, the number of mines using bolts for roof support increasing from 445 in December, 1950 to 530 in December, 1951. Consumption of bolts more than doubled, reaching a total in excess of 2,500,000 per month. Experience with bolting under different physical conditions of seam and roof has been sufficient to point the way to certain correct practices in selec-



A continuous stream of coal from face to surface is possible

tion of materials and their application. It has been generally accepted that the adoption of roof bolting must be carefully planned and systematically applied. As a result there have been a minimum of failures and a marked improvement in the accident rate chargeable to falls of roof. Direct and indirect economies and production efficiencies offered by roof bolting have been conclusively proven over a wide range of conditions, but it is equally true that bolting is not applicable to all types of roof, or a panacea for all roof troubles.

Improved rotary drills for bolt holes, and hydraulic wrenches for tightening nuts and bolts are now available to suit a variety of local requirements. Roof bolting machines of the small portable rubber mounted rotary type continued in strong demand.

Emphasis throughout 1951 was particularly strong on dust collection for both rotary and percussion drilling. A number of types of dry dust collecting devices of both foreign and domestic make are available and have demonstrated their ability to meet the health specifications of the Federal Code. Equipment for wet rotary drilling is available and quite efficient.

Use of wooden pins instead of steel bolts has been continued locally to a limited extent.

Self propelled timbering machines have been installed in combination with conventional mechanical units to lighten the burden and reduce the cost of handling heavy cross bars where roof conditions require their use. The advent of roof bolting, however, has had the effect of curtailing the demand for both wood timber and timbering machines, some of which have been converted to drilling.

Roof bolting has not been attempted in combination with continuous mining, except as a substitute for wood supports and requires the customary time interruption for installation. It is conceded that a full measure of productivity and cost reduction cannot be attained with continuous mining machines until some method of continuous roof support is developed. An intensive study of roof action, compressive forces and stresses developing under continuous mining conditions, in which the time factor plays a most important part, is called for. Initial steps in this direction have been taken.

In 1951 there was also a revival of roof sealing with plastic and other compounds to counteract scaling and weathering of exposed shales.

Study Haulage Methods

The marked shift from track to off-track mining, previously mentioned, carried through to transportation at the face, panel entries and on the main line. Reductions in productive time losses incident to face transportation have been accomplished in the past with the introduction of larger and larger capacity mine cars, and the use of the more flexible rubber tired shuttle car. There still remains an average change time loss of 25 percent with conventional mining and possibly greater with continuous mining. The latter definitely places emphasis on the need for better face and service transportation.

Several ideas for correcting this weakness were developed during 1951, but were still in their experimental phases at the end of the year. These include several makes of two wheeled, portable, cascade type belt conveyors —extensible retractable type package unit belts—and self-propelled, conveyor trains which operate between the loader and the panel transportation system automatically advancing and retreating with the former. The bridge or "piggy-back" type of conveyor has been used successfully in combination with room conveyors, and may find wider application in the near future. A readily extensible type of stainless steel shaker conveyor which can be spooled and unspooled to a depth of 600 ft or more without interruption should be ready to prove its worth in 1952.

Substitution of panel belts for track in intermedite transportation between shuttle car service and main line increased in both older mines and new developments. The trend toward replacement of shaft openings with slopes, primarily in new operations, has promoted the use of conveyor belts for main line transport also. Some of the highest productivity per man day and lowest cost per ton is being achieved in all-belt mines.

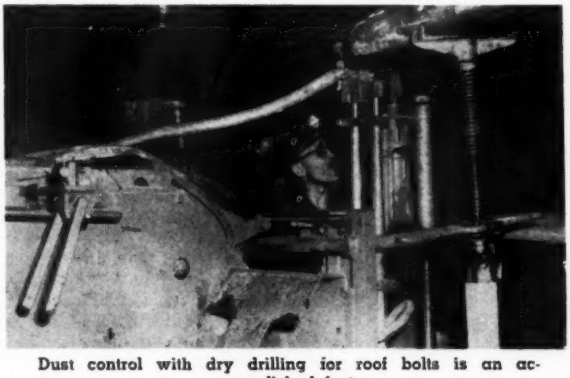
Occurrence of fires both here and abroad has drawn attention to certain hazards in connection with belt conveyor installation and operation. Considerable research has been initiated to develop non-flammable belting materials. A relatively fireproof belt of plastic materials has been announced in Great Britain, and is reportedly ready for field trials. Another idea, called "Cable-Belt Conveyor" has been put into practice there also.

Experiments with stainless steel strip as a replacement for rubber belting in surface plants and for underground use were expanded, with field trials continuing under actual operating conditions.

Use of diesel power underground became a more prominent issue as a result of the efforts of foreign mine locomotive manufacturers to extend their markets to this continent, and the appearance of both an American built diesel locomotive and shuttle car. Anticipated power, safety and other requirements in the producing areas of coal mines of the future merit a more reasonable and practical approach to diesel powering than has been expressed by legal and other limiting factors in the past.

Power demands for continuous mining are quite specific and large by comparison with those of conventional mining units. Higher voltages of electric power, transmission of hydraulic power from remote locations, and the substitution of alternating for direct current are being carefully studied in an effort to find the most economical and practical solution.

(*Continued on page* 65)



Dust control with dry drilling for roof bolts is an accomplished fact

England is trying a new idea in belt conveyors

Diesel powered equipment is finding more use underground every year

Underground Metal and Nonmetallic Mineral Mining

Advances in Rock Breaking, Loading and Transportation Increase Unit Output per Man Day

WITH the national defense effort in high gear, the mining industry is being called upon, to turn out more than ever. On every hand urgent pleas from Government and Industry stress the need for more copper, lead, zinc, aluminum, iron ore and the host of other metals and nonmetallic minerals needed to build the machines of war and peace. As on every other occasion, when the call has gone out, mining men everywhere are answering the challenge.

More tons per man day is the slogan heard at all mines large or small. Slogans unfortunately, though inspiring, do not put ore in the bin. Shafts must be sunk, stopes and haulageways must be developed and finally the ore itself must be broken, loaded and started on its way. To increase the total output of any mine, with the number of skilled miners on the working force static at best, the output of each man must be increased as much as possible. To find out what steps have been taken in this direction during 1951 we must examine the record in each of the three main subdivisions of hard rock mining, namely; rock breaking, loading and transportation.

Rock Breaking Advances

During the year the problem of balancing drilling machines, drill steel and bits demanded solution and many combinations were tried at various mines throughout the country. In general these tests indicated that the best criterion for evaluating any system is the cost of a ton of ore delivered to the mill.

In some cases an indicated reduction in drilling costs was followed by increased secondary breaking requirements or increases in loading or transportation costs which completely offset the savings which were expected. However, there is still a definite trend toward increased use of tungsten carbide tipped bits in some areas while one-use bits are preferred elsewhere.

Use of the airleg drill in combination with either of these continues to draw considerable attention. Where tested under optimum conditions the following advantages were reported as contributing to this combination's popularity:

(1) increases in footage drilled per shift were anywhere from 30 to 50 percent;
(2) 50 percent was saved on initial capital outlay;
(3) there was an appreciable saving in the volume of air used;
(4) no setup time was required; there was 20 percent more available drilling time;
(5) great savings in powder were reported as a result of smaller holes and better distribution of powder throughout the mass of rock to be broken;
(6) handling lighter equipment resulted in less operator fatigue.

Where all these advantages accrued the net result was an increase in ton-

nage broken per man shift and lower cost per ton broken.

While there are innumerable places where the lightweight, airleg drill combination will give advantages similar to those enumerated above many tests indicated that heavier equipment will not be replaced but will continue to find new uses. Improved models in conjunction with alloy steel drill rods and tungsten carbide or one pass bits will do a better job on certain operations. For long hole drilling with percussion drills, especially, the stability of the heavier machine and firm mounting on column or arm is a necessity. Smaller drills mounted in aluminum shells for arm or column mounted drilling were also found to have wide application especially with hard tipped bits.

At the oil shale mine of the U. S. Bureau of Mines at Rifle, Colo. drilling research was continued during the year. In testing various kinds of drill rods, those made from alloy steel gave the best drilling rate and the lowest cost per foot of hole. Some research was done on rotary drilling in oil-bearing shales and it was reported that a test drill has advanced at the rate of over 108 fpm! While this is not applicable to all hard rock mining it is a portent of things to come.

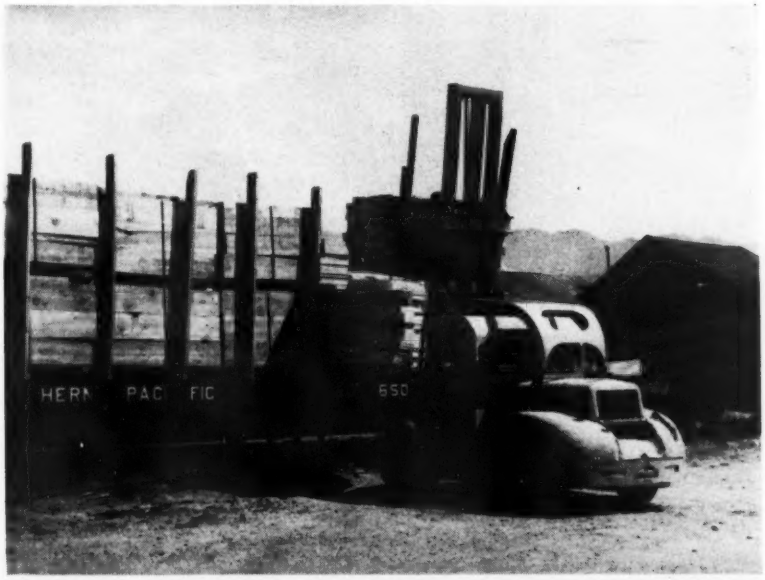
Tennessee Coal & Iron Division of U. S. Steel Co. is using rubber tired, air driven jumbos which mount, on movable arms, two three-in. cylinder machines having a six-ft chain feed as standard equipment. This type of jumbo requires no wedging against the back and the weight of the jumbo can be taken off the tires by means of jacks.

In the right place the airleg drill will deliver more tons at less cost

Smaller diameter and longer holes have necessitated a change in packaging of explosives. Most operators report lower powder consumption as a result of smaller drill holes. This is logical as miners are unable to load a small diameter hole as heavily as a large one. Savings of up to 30 percent of explosive costs have been reported with smaller drill holes.

Electric blasting underground is becoming more important. Electric blasting caps are improved and are now made with plastic covered lead wires. The use of a milli-second delay caps is growing more widespread. Some operators report less powder consumed, less concussion and less drilling required when using this kind of cap. Fuse ignitors and connectors are being used, effecting greater safety to the worker and eliminating missed holes.

Drilling and rock breaking continues to be the most expensive part of mining and keen interest is being shown in experiments in long hole drilling and various forms of radial drilling.



Savings realized from mechanization of timber handling more than warranted the investment made

Diesel Loco Approved

After the ore is shot down and loaded the problem of hauling it to the surface becomes of prime importance. Much interest has been aroused in diesel locomotives underground. The U. S. Bureau of Mines has approved such a haulage unit for use in metal and nonmetal mines. It has also approved the use of a diesel powered shuttle car for use in metal and nonmetal mines.

Gordon MacVean, president, National Mine Service Co., manufacturer of the first diesel locomotive approved by the USBM reports that the locomotive's draw bar pull may be reckoned at 34 to 35 percent of its weight due to the use of a hydraulic torque converter to transmit power from motor to wheels. Pending the gathering of more experience it is safe to predict that the power and freedom of the diesel unit will move it into the front rank for rail haulage underground. Conveyor belt haulage also moved ahead in 1951.

Inland Steel Co.'s Sherwood Iron Mine, Iron River, Mich. is producing approximately 500,000 tons of ore annually with a working force of roughly 90 men using belt conveyors for transportation. It is reported that their cost per 1000 tons is $1.56 with conveyor belts as compared to $5.46 with mine car trains. The problem of handling sticky bulk materials is increased in belt transportation. To overcome this officials of the National Iron Co. of Duluth, Minn. have developed a system whereby the conveyor belt is twisted 180 degrees. This allows the clean underside of the belt to ride on the return idlers eliminating much maintenance and cleanup work. At the time when this development was reported the installation was still in the experimental stage and its soundness had not yet been demonstrated by actual prolonged field operation. If successful, it will do away with one of the most irritating problems encountered in the handling of sticky ore on belt conveyors.

Automatic traffic controls, typified by those installed at the Climax Molybdenum Co.'s operation at Climax, Colo., speeded up haulage safely. Outside and inside train dispatchers are aided by an electrical control system. This system has enabled as many as 51 loaded trains to pass through a single track tunnel in a seven and one-half hour shift.

New Hoisting Method

At Calumet & Hecla's mine at Shullsburg, Wis. the first full scale installation of Percy Gardner's hydraulic hoisting system was put into operation. Here 2000 gpm of water lift 1200 tph through a ten-in. pipe from the 330-ft level to the surface at a speed of 500 fpm. All material is fed into the system after crushing in a jaw crusher with discharge set at four in., but pieces of the slabby ore up to 14 by 9 by 4 in. have been hoisted.

Bottom dump skips of improved design were put into service during 1951 to help speed up the hoisting cycle. It is claimed that these skips eliminate sticking of wet ore and require less time to discharge their burden.

Loading Progress

Another important contribution to greater production was the increased use of mechanical loaders underground in metal mines. Crawler mounted machines feeding shuttle cars which in turn discharge into mine cars or onto conveyor belts have raised production rates considerably.

There was also a return to chute loading in some quarters where ore from stopes is pulled into shaking conveyors. These in turn discharge their burden onto conveyor belts to be transported to surface or shaft bottom.

A forward step toward greater output is the adaptation to mining nonmetallic minerals of the continuous type mining machines. Experiments with these in at least two western mines were continued in 1951.

Other developments were the increase in size and improved mobility of many standard underground track and crawler mounted loaders. Here too, a trend toward diesel powered units was noticeable.

Support

Rock bolting as a means of roof support gained considerable headway and was the subject of a special conference in Los Angeles at the AMC meeting in October. Originally developed by the St. Jospeh Lead Co. many years ago, the method has been widely adopted by coal miners. Meeting with considerable success in that field, metal miners have used bolts in a number of experimental installations. Not a panacea for all support problems, the consensus is that it has a definite place in many mining operations and where applicable produces worth while savings and promotes the cause of safety.

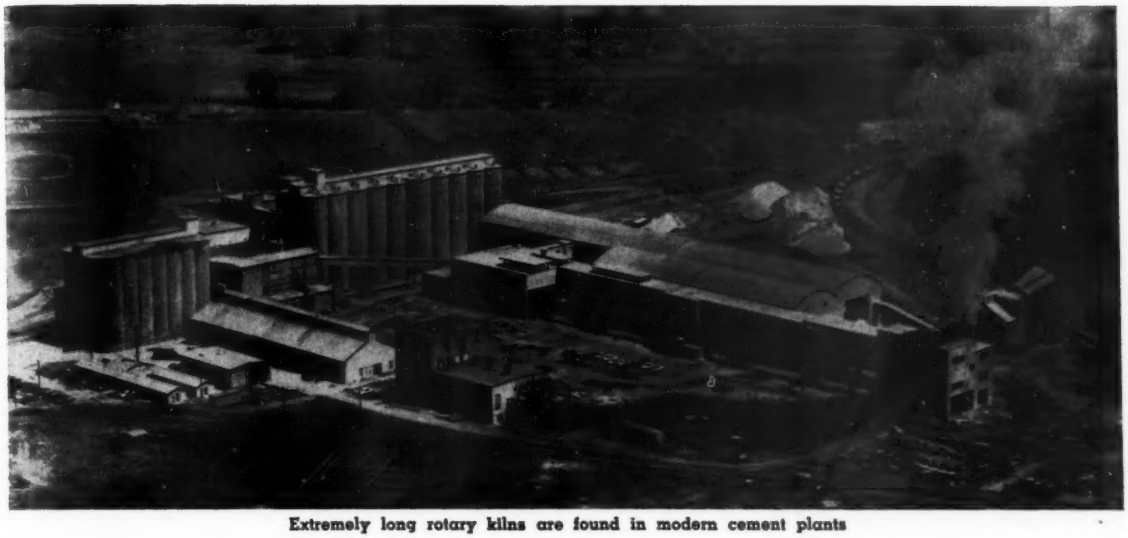
At Miami Copper Co. the installation of circular steel sets was quite successful. They are particularly suited to use in highly altered rock that breaks small and tends to flow under weight. Where the rock breaks big and the weight tends to focus in the big blocks they are not suitable. Their chief virtue lies in easy replacement of lagging between closely spaced sets. This results in lower maintenance and replacement costs over the life of the opening thus supported.

Packaged timber handling was more widespread during the year. Special equipment was developed to facilitate the handling of precut timbers on surface to the cage and for handling rough timber to the sawmill. Mechanization of these functions has more than warranted the investment in specialized machinery and the savings extend to the underground handling and erection by timber crews.

Year by year improved mining methods are incorporating all the innovations devised by manufacturers of drills, drill steel and drill bits, mechanical loading devices and faster transportation and hoisting media. The net result is improved production from each man engaged in mining of the metal ores and nonmetallics.

Progressive mining companies are quick to try any new wrinkle that may mean more ore with the expenditure of fewer man hours. Each step toward more complete mechanization is a step toward greater safety and more efficient operation. The trend in 1951 continued along the upward path begun in earlier years. It is safe to predict that 1952 will show the curve swinging even more steeply upward.

Jumbo mounted medium or light drifter drills were used to good advantage



Extremely long rotary kilns are found in modern cement plants

Portland Cement Keeps Pace

Increased Output from Expanded Capacity Will Continue. Prices Stay Low

By W. A. WECKER
President,
Marquette Cement Mfg. Co.

THREE years ago, in 1949, the portland cement industry shipped 206,000,000 bbl of cement. In 1951 it shipped about 40,000,000 bbl more. All available evidence supports the conclusion that 1949 shipments represented the full effective post-war capacity potential of the entire industry. Thus the additional 40,000,000 bbl shipped in 1951 all came from new capacity added during the brief period of less than four years, since the middle of 1948.

But that is not by any means the full story. Further additional capacity came into operation during the latter months of 1951 and still more will come in during the current year. A study of known data indicates that the full effective annual capacity potential will be close to 265,000,000 bbl before the close of 1952.

Capacity Expanded

It is significant that all new capacity since 1948, with a single exception, was built by existing producers. Only one new company entered the field and even this one had a collateral interest in the business. Most of the new capacity came about through additions to existing plants. Completely new plants at new locations were relatively few.

The obvious explanation is that new companies, generally speaking, could not bring about a proper relationship between the required investment at current high construction costs and the earning potential of new plants at current selling prices for portland cement. Under such circumstances, the only possibility of expansion rested with those who could merge current construction costs and income with an existing business, relying upon the whole for a satisfactory return on the total investment. And in this direction the best results for the present, if not for the long term, were to be obtained by adding capacity at existing plants.

Consumption Trend Obscured

Portland cement shipments moved to a new record peak in each succeeding year following World War II. The major portion, but not all, of these increases followed the general construction trend. The remainder represented basic increases in the use of portland cement concrete in relation to total construction.

The true trend for the future was obscured in 1951 by the impact upon construction of the rearmament program. Major shifts took place that year in classes of work undertaken. Building for civilian uses declined, while all public and private construction associated with defense increased. Apparently, this also will be the case in 1952.

It does not seem rational to expect an unbroken continuation of the past year-to-year rise in cement consumption. Certainly there will be plateaus and valleys in the consumption trend line in years to come. But at the same time, substantial basic factors prevail which should tend to sustain cement consumption at high levels. Among such basic factors are increasing population and the persistent common urge to add to and to improve upon the facilities which give us greater comfort, convenience, and cultural development. As a consequence, substantial acceleration of building of all kinds must take place in future years. We are at present far behind schedule in building roads, superhighways, city streets, schools and municipal service facilities. Demand for new homes probably will not subside materially for some years despite record starts during the past two years. New urban rebuilding jobs of tremendous proportions, including transportation facilities, await only availability of materials and a shift in emphasis on what is needed most at the moment. Portland cement usage is substantial in each of these classes of work.

On the basis of the foregoing, the

long-term outlook for a high level of cement consumption appears encouraging. A backlog of work, similar to that during World War II, is being built up. But it must be remembered that when we emerge from the current rearmament effort, the cement industry will be able to ship at least 60,000,000 bbl more per year than in 1949. This is close to 30 percent more than in that year. It is close to 10 percent more than the record 1951 shipments. Everything considered, it seems improbable now that cement demand in the foreseeable future will exceed the production potential of the industry as it will stand at the end of 1952.

Role in Rearmament

Portland cement concrete will continue to play a big part in the national rearmament program. It is a highly essential part of the particular kinds of construction required by the armed forces and will continue to be used in tremendous quantities in such work. In addition, it is a large basic requirement in the far-flung industrial expansion which got under way in 1951.

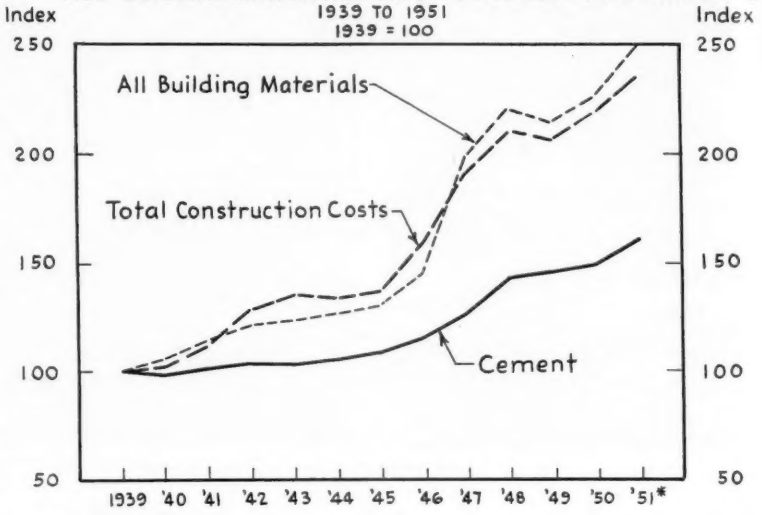
In the field of military and naval facilities, some idea of the extraordinary need for portland cement concrete may be gained by noting the volume of this type of construction during the past two years. In 1950, construction for the armed forces accounted for less than $200,000,000. In 1951, it increased to about $1 billion. For 1952 we have before us governmental authorizations for more than $3½ billion for *known* military and naval installations inside the continental United States alone. And this does not include projects which must remain secret for security reasons.

But dollar volume alone does not tell the whole story. The other part of the story is that the use of concrete in this work is far greater in proportion to value than for construction in general. Experience indicates that about 20 bbl of portland cement are used per $1000 of military and naval construction whereas the average for general construction is only about eight bbl.

The current military and naval program includes the widest possible range of types of construction—from laundries to landing strips. About 60 percent of the total goes to the Air Force for construction of runway pavements, fuel storage facilities, operational, maintenance and supporting projects. The important part that concrete will play in this program was highlighted by Congressman Vinson when he said to Congress, in the report of his committee, "With the exception of a limited number of supporting aircraft, both the Air Force and the Navy will be fully equipped with jets. The net effect of this radical change is that entirely new fuel systems must be installed; all packing aprons must be strengthened; all runways must be widened to 200 feet and extended to at least 8000 feet in length. In addition, both the aprons and runways must be strengthened by the addition of several inches of concrete."

For the basic industrial expansion required to provide the tools and implements of defense, unusually large quantities of portland cement concrete were used in 1951. Private plant investment for this purpose was originally estimated at $50 to $60 billion for the three-year period beginning in 1950. But since speed was necessary, these industry programs were pushed ahead on a large scale at once. As a consequence, private plant construction in 1951 was at a rate approximately double that of 1950. Great expansion has taken place but much still remains to be done. To cite but

INDEX OF CEMENT PRICES COMPARED WITH ALL BUILDING MATERIALS AND TOTAL CONSTRUCTION COSTS



* First eight months only

Source : U.S. Department of Commerce

PORTLAND CEMENT MILLS IN U.S. AND CANADA

Cement plants are near markets

a few examples, the aluminum industry is now engaged in a $500,000,000 expansion; the electric power industry is investing $8 billion in new generating and distributing facilities; the petroleum industry has embarked on a billion dollar expansion program; and the chemicals industry has authorized nearly $700,000,000 for new production facilities.

Level of Cement Usage in 1952

Past experience indicates that a decline in construction volume does not necessarily mean that cement usage will decrease. The type of construction, as well as the physical volume, determines the amount of portland cement that will be used in any given year. Consequently, the current predictions of a moderate decline in 1952 total construction may not result in a comparable decline in cement consumption. To be sure, we do face further reductions in home construction and in commercial, religious, recreational and institutional building. Highway building in some areas also may be somewhat less. Reductions such as these will come about largely because of Federal restrictions on work and materials and not because of lack of demand. But as an offset we have in hand for 1952 the tremendous military and naval construction program already discussed and a continuation of industrial expansion throughout at least a good part of that year. In these last two categories, particularly in military and naval construction, cement will be required at an exceedingly high rate in relation to value, as already pointed out. This could well be the single factor which might maintain 1952 cement shipments at least at the level of 1951.

Prices Remain Low

Cement prices are still relatively low, and there is no doubt that portland cement will continue to be a real bargain throughout 1952. For the first eight months of 1951 the Department of Commerce price index on portland cement averaged 161 in relation to the 1939 base, as compared with 250 for all building materials, and a 236 cost index for all construction. (See accompanying chart.)

This situation continues to reflect the fact that cement prices generally are based upon depreciation charges applying to plant facilities built many years ago at costs far less than those of today. It also reflects the fact that large portions of existing plants are completely depreciated at this time and that, consequently, total depreciation charges today are exceedingly low in relation to the huge original investments involved. Prices would have to be materially higher if current depreciation charges were on the basis of full plant cost values as of today. The buying public is, of course, the beneficiary in this situation.

What About Delivered Pricing?

Cement prices are low, but the delivered cost of cement at almost every destination varies with the source of supply. As a consequence, one purchaser may pay more for cement than another at the same destination or the same purchaser may have different costs for cement purchased from different producers. These differences in delivered costs ordinarily reflect differences in freight costs.

This situation results from the generally accepted interpretation of the opinion of the Supreme Court in the proceedings brought against the cement industry by the Federal Trade Commission. While that decision was in a case against the cement industry, the rule of law applies to all industry. Many businessmen, including most cement producers interpret the opinion as declaring it to be unlawful to meet the lower prices of competitors, with lower transportation costs to the place of delivery, except in occasional and sporadic instances. Accordingly, they have generally adopted an f.o.b. plant price method of selling.

On a few occasions since this decision in the *Cement Case*, the FTC has issued involved statements purporting to indicate that not all meeting of competitive prices (commonly referred to as freight absorption) is unlawful. These statements do not point out with any clarity under what circumstances such competitive pricing is lawful. They do not set forth standards upon which any businessman can rely. Moreover, businessmen are conscious of the crusade against competitive delivered pricing which has been carried on by the commission for years. They are also conscious of the commission's many efforts in past years to compel by legislation and litigation one-price f.o.b. plant pricing. Many are fearful that the pronouncements of the commission are deliberately made with the idea of trapping producers into the adoption of policies which the commission can contend are unlawful and use as justification to further its crusade for f.o.b. plant pricing.

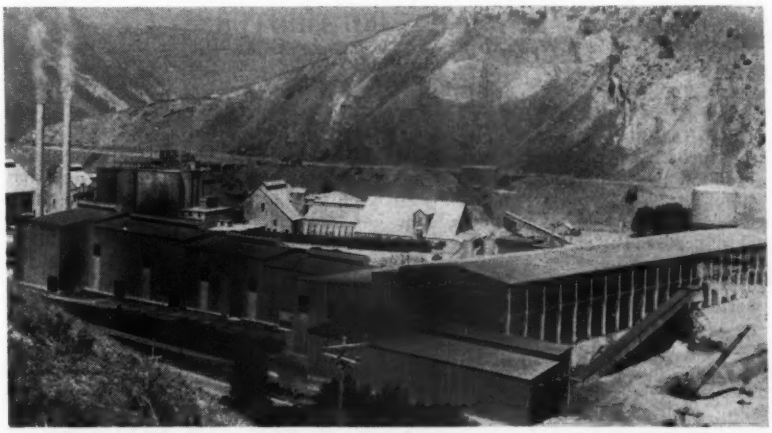
Clarification by law is the only solution to this problem upon which businessmen can rely. The Bill S. 719 now pending in Congress should be passed and signed by the President. If the FTC is really sincere in its statements that under proper circumstances the meeting of competitive lower prices is proper, it should support this legislation. Should the commission continue to object to the bill and urge the President to veto it, the only inference to be drawn will be that the commission does not really mean what it pretends to say, and that it has not abandoned its crusade to abolish competitive delivered pricing. If the bill fails to pass, the present confusion as to pricing will continue.

Industry Improved Operations

Many improvements in cement making have taken place in the last decade. These have been aimed at making better products as well as at conservation of manpower, fuel and power. Large sums are spent for such improvements year after year. Much money, too, is spent every year for large-scale replacements. This is because machinery and equipment wear out quickly in cement plants or become obsolete or inefficient long before the end of their useful life.

Among the major improvements that have taken place in the past ten years might be mentioned the almost complete replacement of narrow gauge rail haulage in cement plant quarries by trucks. Good cost savings have resulted from this in most cases.

(*Continued on page* 58)



Existing facilities were expanded at Ideal Cement Co. plant, Devil's Slide, Utah

Mineral Dressing

The Greater Butte plant will eventually treat 15,000 tons of ore daily by flotation and leach-precipitation-flotation

Need to Approach Self Sufficiency Spurs Construction of New Plants and Research Toward Lower Cost Beneficiation

By NATHANIEL ARBITER
Associate Professor of Mineral Engineering
School of Mines
Columbia University

PROGRESS in mineral dressing is measured both in terms of quantity of production and of efficiency of operation. Increased production depends on new plants and on expansion of the old. Increased efficiency comes through better use of existing equipment, the development of new equipment, and better understanding of process technology and theory. By all of these criteria, progress during the past year has been notable.

New Plants Planned

The most striking feature in milling during 1951 has been the large number of reports describing both new plants, and plans for the construction of new plants in the near future. While a major part of this activity relates to copper and iron production, the expansion will also include concentrators for a variety of other metals and minerals. The underlying reason is, of course, the rearmament program, and the imperative necessity of attempting to approach greater self-sufficiency in strategic minerals.

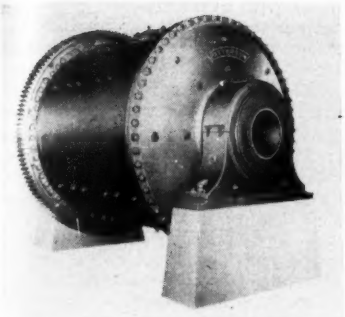
IRON: The most interesting single development during the year was that by the Reserve Mining Co. in awarding contracts for a concentrator at Beaver Bay, Minn., which will initially produce 2,500,000 tons of magnetic concentrate a year from 7,500,000 tons of ore. Eventual plans call for a yearly production of 10,000,000 tons of concentrate. It is most fitting that the first contemporary full-size plant to treat the taconites commercially will be based on the deposits at Babbitt, where 30 years ago D. C. Jackling and his associates erected a plant to treat this same taconite. A comparison of the flowsheet of the original Mesabi Iron Co. at Babbitt with that described for Reserve's plant, is an index of milling trends. The older plant featured four stages of crushing and five of screening, with many stages of magnetic separation, before and after the grinding. The new plant will use three-stage crushing, with screens employed only for scalping after the primary crusher. Grinding will be in rod and ball mills, and magnetic separation will be in two stages, interlocked with the grinding circuit.

While Reserve is first under the wire with announced plans for a taconite concentrator, another project of similar scope is on the drawing boards. In addition Erie is now operating, and Oliver should this year start to operate, a large pilot plant on the low-grade iron ore. Elsewhere in the iron picture: Cleveland-Cliffs together with the Ford Motor Co. are planning to produce 400,000 tons of concentrate yearly by 1953 from Michigan jasper deposits; Bethlehem will produce high grade magnetite concentrates from the deposits near Morgantown, Pa., and Jones & Laughlin will treat martite ore at Benson Mines. All of this activity indicates that by 1960 a sizable fraction of steel production will be based on beneficiation of low-grade iron ore. From taconite alone, it is estimated that 13,500,000 tons of concentrate will be produced in that year.

COPPER: Announcements of new concentrators for copper have been equally numerous. In one month alone financial negotiations were reported for four operations which will produce a total of 120,000 tons of copper annually. In brief summary:

The Greater Butte project will eventually treat 15,000 tons of one percent ore daily by flotation and leach-precipitation-flotation. Anaconda will also spend $32,000,000 to recover 30,000 tons of copper yearly from the oxidized ore at Yerington, Nev. The flowsheet will involve acid-leaching and cementation with iron. Phelps Dodge will invest $25,000,000 to recover 38,000 tons of copper annually from the Lavender Pit at Bisbee. Copper Cities will recover 22,500 tons of copper yearly from their property near Miami. The Castle Dome concentrator will be moved to this site. Both the Arizona operations will probably involve standard flotation and smelting. In Michigan, Copper Range has negotiated a government loan of $57,000,000 for its White Pine project. This will involve milling 10,000 tons of ore daily to produce a copper concentrate. Extensive pilot plant tests have been carried out to determine the final method for treating the concentrates.

NICKEL-COBALT: In other metals, much interest is centered in the treat-



Large higher speed rod mills led to two stage rod mill circuits to cover a broader range of sizes

ment of complex copper-nickel-cobalt ores both in the United States and in Canada. Calera announced the first production of copper from the Blackbird deposit, and tune-up operations on cobalt. There, at Frederickstown, Mo., and at Lynn Lake, leaching of flotation concentrates, followed by selective recovery of metals from the leach solutions are under development. The use of acid or ammonia under pressure for leaching, and of hydrogen or carbon monoxide also under pressure to precipitate metal powders, are novel features. In Cuba, Nicaro is reopening to recover nickel and cobalt by ammonia leaching.

These have been the highlights in the new plant picture. Together with other developments, both large and small, in lead, zinc, vanadium, antimony, coal, asbestos and fluorspar, they emphasize the expanding frontiers in beneficiation.

Mill Equipment & Operation

Grinding: This operation, the largest cost item in concentration, continues to be the target for improved efficiency. With greater production the keynote, increased capacity as well as decreased steel and labor costs are the objectives. The rod-mill ball-mill combination for products in the finer mesh sizes is becoming standard. Inco's new concentrator at Creighton, the Calera concentrator, the projected Reserve mill at Beaver Bay, and a large new concentrator abroad all use this circuit. Large, higher speed rod-mills, as used by Consolidated at Chapman Camp, led Myers at Copperhill to propose a two-stage rod milling circuit to cover a broader range of size-reductions more efficiently. This would use the higher speed rod-mill to obtain impact crushing on feeds in the range 1½ to ¾ in., and a slower speed rod-mill for coarse grinding ahead of a ball-mill.

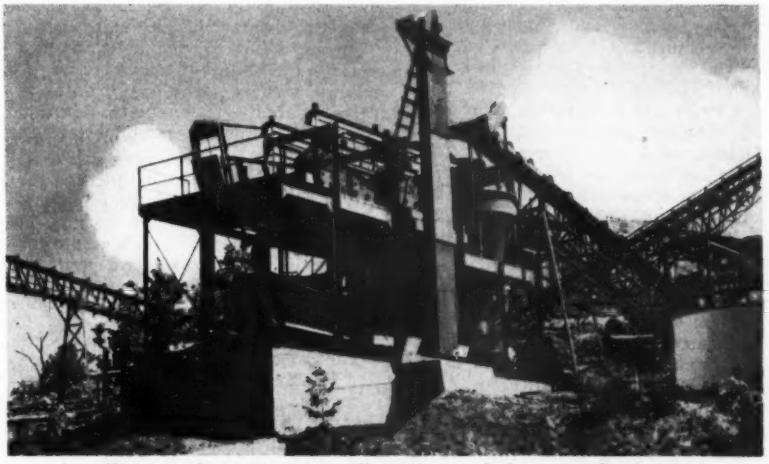
Hardinge reports further tests on the tricone mill against comparable cylindrical mills, with five to ten percent increase in efficiency for the tricone. Allis-Chalmers entered the ball segregation field with spiral liners suitable for conventional cylindrical mills. Machines for attrition grinding are being developed by Western Machinery and by the Bureau of Mines.

Crushing and Screening: Allis Chalmers announced a new series of gyratories, and a new rolling toggle for jaw crushers. The latter is said to last much longer than the conventional sliding toggle, and to require no lubrication. Impact breakers continue to be of interest both here and abroad. The Cedar Rapids machine is used at a new uranium mill, where its low production of fines is desirable. G.E. of London reports a new hammer mill for treating sticky material. Developments in screening include another electrically-heated screen by Hannon and Nordberg's preliminary report on a vertical screen.

Classification and Thickening: Cyclones are attracting wide interest in this field. Their use as primary thickeners in coal preparation plants is reported to require lower investment costs and less space over conventional thickeners. They are claimed to deslime effectively down to 10 microns, or to thicken with very dense spigot products but slimy overflows. Automatic control is possible in thickening to maintain a constant spigot density against wide variations in feed density.

Concentration: The large potential market for magnetic separators in taconite concentration has brought out several new machines. Dings has developed a new Crockett-type and a new drum separator, and Jeffrey a new drum. Laboratory studies on a three-phase alternating current separator, with no moving parts, indicate a possible use in obtaining supermagnetite concentrates.

The Weinig concentrator, using ore middlings for heavy medium, is reported to be yielding favorable test results. The H.M.S. process finds new applications in the African diamond fields to obtain preliminary concentration of low grade feeds. The Premier plant will treat 320,000 tons of 0.23 carat feed monthly. Further fuel for the fire in heavy media is Mascot's



Heavy medium separators will continue to find new applications

Fine grinding circuits require careful synchronization and control

report of significant savings by the switch from galena to ferrosilicon. St. Joe will equip the Hayden Creek Mill with a new 2000 ton a day sink-float plant; Cleveland Cliffs will use this process to treat stockpiles from the Holman-Cliffs mine on the Mesabi; and progress is reported in sink-float treatment of the Northern Alabama brown iron ores. The use of the cyclone as a heavy medium separating vessel, with magnetite as the medium, is reported to extend the separation size range down to 48-mesh. Two such applications are under way on the Mesabi. Other new applications of sink-float are to manganese ores on the Gold Coast and to chrome ore in the Philippines. The use of a spiral classifier as a heavy medium vessel allows the production of a middling product.

Humphrey reports further expansion of the field for spirals, with present operations on phosphate, mica, ilmenite and rutile, and potential applications to native copper, specular hematite, sphalerite, pyrite and coal.

Flotation news is scant. Three new mechanical cells are in the field—Booth, Denver, and Payne—two of them using double impellers. A new air cell for coal is reported from England. Also from England comes news of a large coal preparation plant using the Chance process together with flotation, and of a process at Roddy Moor producing low ash coal by flotation, for processing to carbon electrodes. Pilot plant flotation activity in Michigan suggests that this state may produce the first flotation mill for iron ores. At least two companies are active. Miscellaneous applications of flotation are to clarification of industrial wastes, using a pump and injector for agitation and aeration, and to recovery of micron-size lithium salts, also with unconventional equipment.

Auxiliary Equipment: Progress in combatting abrasion was reported in two directions. Linatex rubber, a specially treated product from abroad, was said to have excellent wear resistance in protecting metal in contact with ore pulps. A major advantage is its ease of bonding to metal parts. At the opposite extreme, silicon carbide pump runners were claimed to outlast by far conventional steel parts. Micarta bearings are coming into wider use, particularly for grinding mills, where power savings of the order of five percent result from reduced friction. Automatic controls continue to find new applications. An improved pulp density controller was described; automatic control of the cyclone thickener has already been mentioned; and a control for maintaining constant pulp density and pulp level in flotation cells has been developed.

Basic Research Sets Pace

Significant papers on grinding fundamentals appeared during the year. Piret, reviewing his research on energy-surface relationships, confirmed that only a small fraction of the applied energy was responsible for new surface production. Shellinger found that a major portion of the energy applied in grinding could be measured as heat, using a ball-mill calorimeter apparatus. Gaudin and Spedden reported preliminary results with "tagged" particles in grinding tests; they were able to trace the product size-distribution obtained from a particular feed size-fraction in the presence of other sizes.

In flotation, collector-mineral reactions were studied by investigators from Cyanamid, M.I.T., and Utah. The Cyanamid results were particularly interesting in demonstrating that the effect of a particular surface concentration of collector on flotability depended on the surface concentration of depressant. Gaudin and collaborators described further results with tracers used to obtain quantitative collector adsorption data. Cook, at Utah, presented data in support of his contention that collector and depressant molecules, rather than ions, are effective in flotation. Hassialis offered evidence indicating that the collector may be mobile rather than fixed on the mineral surface. The use of flotation rate constants to evaluate flotation performance was advocated by Arbiter.

Valuable aids to research and testing were articles on a new method for surface area measurement, on procedures for heavy medium testing, on the use of a heavy liquid assay for chrysocolla, and on a rapid zinc determination.

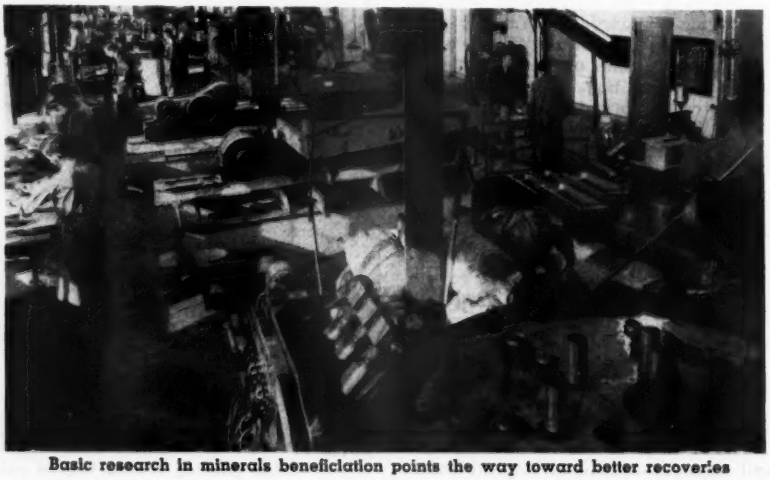
Things to Come

The reviewer has a broader obligation than a mere reporting of the news. Having surveyed the immediate past, he should, if sufficiently bold, attempt to forecast the direction of progress in the near future.

Crushing circuits will remain standardized, with gyratories and cone-type machines used for larger tonnage operations and jaw crushers continuing to serve for smaller capacity requirements. Single stage grinding will prevail only for smaller operations. The rod-mill ball-mill circuit will come into wider use with larger tonnages. Further staging of grinding, except for very fine products, may be resisted as leading to circuit complexity. Heavy medium separators will continue to find new applications. (One process alone has 90 operating plants, and 40-50 more presently planned.) The centrifugal force machines will be used more widely in concentration and in classification and dewatering. Flotation appears to have reached a plateau in the sulphide field; its principal advances will be in non-metallics, and in improved processing through better machines and better understanding of technology. FluoSolids roasting will expand in processing metal concentrates. (At last report 30 reactors were operating or under construction.) Leaching will be more widely applied to ores and concentrates. Higher labor costs will stimulate greater development of automatic controls. Finally, the Atomic Age will provide an even greater challenge to the mineral engineer in demanding the treatment of lower grade ores, and the development of methods for the recovery of the new metals.

Acknowledgment

To cover the year's progress in a field as diverse and far-flung as mineral dressing must always be a compromise. Any single reporter is limited by his sources of news, and by his interests. I have relied principally on *Mining Congress Journal*, *Mining Engineering*, *Engineering and Mining Journal*, and the *Mining Magazine* (London). In addition, many friends in the industry have brought additional news to my attention, for which I here express my thanks.



Basic research in minerals beneficiation points the way toward better recoveries

Mechanization in anthracite has made greatest strides in strip mining

Coal in the Economic Structure of Our Country

Nothing Can Supplant Coal as Our Primary Source of Heat, Light and Power

By CHARLES DORRANCE, E.M.
Senior Mining Consultant
Stevenson, Jordan and Harrison, New York

THE facts and opinions expressed in this brief article dealing with coal's position in the economic structure of this country are based on a life-time spent in coal—36 years in anthracite and 14 in bituminous coal.

The position of anthracite in our economy is radically different from that of bituminous coal. Anthracite is without question the finest and best natural solid smokeless coal for domestic use produced in our country. The remaining reserve, still of immense tonnage, lies far underground in veins of lesser thickness, with a very great inflow of underground water to be handled, an extremely hard vein structure difficult to drill and blast and in many districts containing large amounts of impurities which must be loaded with the coal at the face and transported to cleaning plants.

Mechanized mining (excluding stripping) has made little or no progress over the years in anthracite. This is primarily due to two causes (1) the character and hardness of the vein structure and (2) the fact that from a sales realization standpoint it is vital to obtain the greatest possible proportion of the larger sizes in the cleaned product for market.

Therefore, except for the few anthracite companies fortunate enough to obtain a large proportion of their output by stripping, the total cost of mining, cleaning and marketing anthracite is unfavorable competitively. Its markets have been and continue to be restricted and narrowed by the so-called "convenience" fuels—oil and gas. This trend continues even though in many instances the heating cost to the householder of oil or gas is materially higher than anthracite—such is the effect of the "more abundant life."

Anthracite Looks Ahead

It must not be inferred that the anthracite industry has sat idly by while all this happened. Continued and efficient research by the Anthracite Institute has developed automatic domestic heating furnaces and stokers which, if properly serviced, bring a very high degree of "convenience" to the domestic user of anthracite. However, there still remains unsolved the "convenience" factor of ash and ash removal from which the householder is relieved with the use of gas and oil. The industrial use and market for anthracite has been, generally

speaking, limited to areas where a lower freight rate for anthracite may allow a delivered price per million Btu competitive with bituminous coal.

From 1931 to 1937 the author was one of the leading spirits in attempts to stabilize the anthracite industry. After he left anthracite for bituminous coal in 1937 a program was developed which finally resulted, with the legislative sanction of the Commonwealth of Pennsylvania, in proration of working time by a committee representing the Commonwealth, the operators and union labor. This control, for basic economic facts stated heretofore, has by no means brought prosperity or even a reasonable return on invested capital, but it has conserved and prevented the economic destruction of hundreds of millions of tons of our great anthracite reserves.

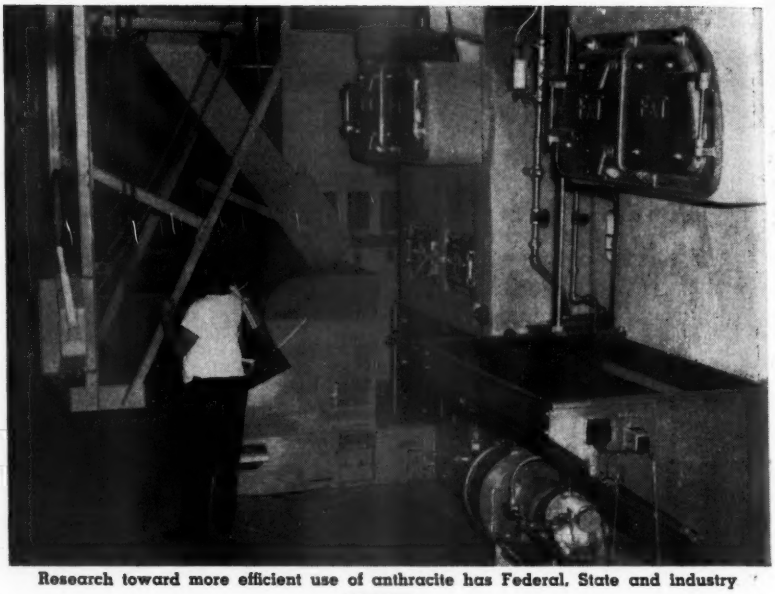
Any optimism for the future of anthracite will depend on two principal factors. First, what the future relations will be as to available supply and price of gas and oil compared to anthracite. Second, and most important, can there be developed mechanical mining and loading equipment which will materially increase tons per man day with a correspondingly great decrease in direct operating cost, without materially affecting the proportion of larger sizes necessary for domestic heating. This finest of all solid domestic fuels—still one of our country's great natural resources—should receive from our Federal Government and from the Commonwealth of Pennsylvania financial or other assistance in research to make anthracite economically available for use in the future. So much for anthracite.

Bituminous Coal's Position Strong

The position of bituminous coal in economic structure of this country is much happier than that of anthracite.

One of the principal reasons this industry ranks *competitively* so high today as a supplier of heat and power is the fact, acknowledged by fair-minded persons within the industry, of John Llewellyn Lewis's long continued position of aid and approval to complete mechanization—mechanized mining, loading, transportation and cleaning—of bituminous coal. This has been one of the greatest factors in allowing the members of the industry by their capital risk expenditures speedily to make the production per man per day of bituminous coal the greatest—many times the greatest of any country in the world.

In the author's opinion the bituminous industry made a serious though patriotic mistake during World War II in financing expanded facilities and developments to produce sufficient coal for our country's war needs. The aftermath shows it might have been wiser if Federal funds had been employed in developing war need production. When demand returned to normal, these Federally owned operations could have been discontinued. In due course when the relation between supply and demand returned to normal the established operating and sales companies within the industry would have been able to obtain a sales realization which would give them a reasonable return.



Research toward more efficient use of anthracite has Federal, State and industry sponsors

However, the position of this bituminous industry today is strong and solid. Our enormous reserves of bituminous coal constitute the best and most available source of power of any country in the world. Aside from the possible commercial use of atomic power, there is nothing which can supplant bituminous coal in the economic structure of our country.

Problems Are Many

Have we no problems in our bituminous industry? Emphatically, yes! We have plenty and always will, even excluding those troubles inherent in our socialistic trend of many years past under the New Deal, Fair Deal, Federal and State wasteful spending

New plants producing metallurgical coal helped make possible the 8,000,000-ton per year rise in steel production

as they affect all of our taxes and attack free enterprise. My dear old vice-president of sales used to define free enterprise as "simply asking for a fair advantage over the other fellow."

Primarily, for reasons heretofore given, we find ourselves in the bituminous industry today in a situation where developed supply materially exceeds demand, i. e., a buyer's market. If it were not for the enormous increase taking place in export our present situation as to prices, bad as it is, would be materially worse. During the war years of sellers' markets thousands of mining companies —small and large—charged and got one to two dollars a ton more than long established companies, who were protecting their old and valued customers. The opportunists are now busily quoting prices as much below a reasonable and fair basis as their prices in the sellers' market were above a reasonable basis. Some old customers who were protected both as to price and tonnage during the sellers' market have forgotten. Some have not. To keep the business of those who forgot, we have had to meet, at least partially, the price cutters and their destructive competition.

Keep Industry Solvent

Today, as some thirty years ago, it is a wise policy for our country to see that the bituminous industry be kept solvent and allowed to receive prices for its product that will allow for material expansion in research and a reasonable and fair return on invested capital. This objective, which the great majority of our fellow countrymen will heartily approve in principle, should not be accomplished by an NRA or another Guffey Act. Considering the fact that bituminous coal represents today and for sometime past only about 35 percent of the total sources of heat, light and power in our country, the members of the bituminous industry, either as a whole or by districts or in any other practical way, should be authorized by the Congress to meet together and fix reasonable and fair minimum prices for all grades, qualities and sizes of bituminous coal without any Federal regulation except maximum prices.

It is fully recognized that many in the bituminous industry will cry aloud —"No Government in Business," "Free Enterprise" (see previous definition), etc. The answer is, no Guffey Act. Action should be patterned along the lines of cooperatives in the milk producing industry to prevent destructive competition. Its purpose is to protect the economic progress and continue safeguarding in times of stress the greatest natural resource of our country. Simply it is asked that Federal and/or State authority sanction the members of the bituminous industry to agree on and *enforce* minimum prices for bituminous coal to conserve and develop, in accord with our country's needs, our most vital natural resource. The only regulatory feature would be control of maximum prices. This control is fair, reasonable and necessary in the public interest.

Research For the Future

Greatest optimism for the future of bituminous coal lies in:

(1) The further development and final success of the pulverized fuel gas-electric turbine for meeting diesel engine competition in transportation; and eventually for small isolated electric power installations.

(2) The development of a practical and economical method whereby our enormous reserves of bituminous coal with high sulphur content may be made available for metallurgical use. This is to be done by some method other than wet table washing in order to avoid the large capital investment for tables with small capacity and consequent high cost of drying the cleaned product.

(3) Continuation and expansion of research looking to methods whereby bituminous coal may be processed as a raw material to produce practically and economically many by-products including gas, oil, gasoline, chemicals, etc., to protect our limited domestic reserves of gas and oil and make us independent of foreign supply in the future.

(4) Continued and expanded research to provide some practical and economical method whereby coal may be transported as such, or in any other form of power from mine to consuming area at a more reasonable cost.

In conclusion, it was suggested that I submit with this article any appropriate charts or graphs. This reminds me of a visit which as a committee of the anthracite industry, Alan Dodson, Albert Jessup and myself, made to confer with Doctor Garfield, U. S. Fuels Administrator during World War I. Jessup was at that time vice-president of Jeddo Highland, whose president, Mr. John Markle, was almost blind. We spent two whole days in the Doc's anteroom, awaiting an audience and passed the time by scanning the graphic charts of Jim Alport and R. V. Norris covering the complete costs of all bituminous and anthracite mining operations. At the end of the second day, still without an audience, while we were walking back to our anthracite house, Jessup said, "There's one fellow Garfield, Alport and Norris can't fool with their graphic charts—that's my boss, he can't see 'em."

More Coal From British Miners

But Manpower Problem Remains

By HAROLD HUTCHINSON

English Industrial Correspondent and one of British Broadcasting Corp.'s Ecoromic Analysts

IN 1951 Britain produced 222,000,000 long tons of coal; 211,000,000 was from deep mines and 11,000,000 tons from open-cast workings. The combined total is nearly 6,000,000 tons higher than in 1950.

Though this is encouraging, the extra 20,000,000 tons of coal a year which would solve half of Britain's economic problems, cannot be produced except as the result of a long, slow and expensive process of reconstruction. The process began immediately after World War II, but in its first years it was virtually a salvage job. During the six years of war all that mattered was to get the coal at any cost, and part of the cost was that no manpower or resources could be spared for development. The mines were worked ruthlessly.

Furthermore, the "easy" coal had long since been mined. There is no easy coal in Britain today. Where the United States produces almost a quarter of its coal by strip mining, Britain produces only one-twentieth. Coal in Britain lies deep—at an average depth of 1170 ft compared with the United States average of 190 ft. United States seams are thicker and there are fewer faults. High production mining methods—the room-and-pillar system—used in Britain generations ago when coal lay at shallower depths, but which she had to abandon, is general in the United States.

Cannot Afford Waste

For geological reasons Britain cannot now use U. S. mining methods extensively. Because United States coal resources are thought of as virtually inexhaustible, there is no need for a high and often costly recovery.

The reverse is the case in Britain, where recovery must be much higher. Britain cannot afford to lose coal, either on the surface or underground.

Salvage and development work done since World War II has succeeded in getting increased production out of a wasting asset and the productivity of the individual miner is higher than at any time in history. The problem in Britain is, that with her industrial output running 50 percent higher than before the war, the industrial consumption of coal is growing faster than production is increasing. United Kingdom industry cannot, as in the United States, depend to anything like the same extent on oil, natural gas or hydroelectric power.

So far the annual increase in coal output has been just enough to keep industry going, but at the expense of coal exports. Britain's inability to export more than the irreducible minimum of about 8,000,000 tons a year has far-reaching effects. For example, it limits the supplies of imported high-grade iron ore obtainable only in exchange for coal, and thus reduces total steel output.

Will Take 10 to 15 Years

The mines have priority for equipment, but even so their major reconstruction to give Britain an additional 30,000,000 or 40,000,000 tons of coal a year, with slightly fewer miners, is a 10- to 15-yr job.

Thirty years ago Britain had 1,200,000 miners and could produce 280,000,000 tons of coal a year—enough to spare for all Europe's import needs. Today there are 696,000 miners, with an average age of 40 years compared with under 30 in the old days—and they produce about 220,000,000 tons. But industrial consumption is going up by 7,000,000-8,000,000 tons a year and is nearly 30,000,000 tons more than before the war. As the average age of the miners is so high, there is a loss of around 1000 men a week. Recruitment barely keeps pace with the loss, but cannot overtake it.

That is the short-term problem. Machinery is going into the mines as fast as they can be adapted to take it and as fast as machinery can be devised for work under especially difficult conditions. The immediate problem is manpower. More men mean more coal.

Although miners in Britain, like miners in the United States, are highly paid wage earners, memories of the distress of the inter-war years are still so strong that many miners prefer to see their sons find work in other industries. And there are other jobs, for Britain is short of industrial manpower as well as of miners.

A democracy cannot order men to work in mines or keep them there if they wish to leave. It does what Britain is doing—improves working conditions and tries, as far as resources permit, to improve living conditions in the mining towns and villages.

Cement Keeps Pace

(*Continued from page* 51)

In raw grinding, many wet process plants have adopted closed-circuit grinding with excess water to take advantage of modern wet classification, hydro-separation, etc., thus improving grinding efficiency.

Most plants have greatly improved their methods of proportioning, blending and homogenizing the raw materials before burning, and have adopted

Modern truck haulage has replaced narrow gauge railways

stricter chemical control based on scientific sampling methods. Plants operating under the dry process have adopted air blending methods whereby the dry ground raw material can be mixed, homogenized and conveyed almost like a liquid.

The cement industry has gone in for longer and longer rotary kilns. A generation ago kilns 60 ft or 120 ft long were quite common. Today the longest kiln in this country is 500 ft long; the longest kiln in the world is 520 ft. In these long kilns the combustion gases have more opportunity to transfer their heat to the raw materials, resulting lower fuel cost and more uniform product through better burning and a lower exit gas temperature.

Where coal is used as kiln fuel, it was formerly common to grind the coal after it had been dried, and to store the finished powder in bins from which it was drawn into the stream of primary air blown into the kilns. During recent years the industry has, in large measure, installed direct-firing unit pulverizers which dry the coal, grind it, and blow it into the kiln in one operation.

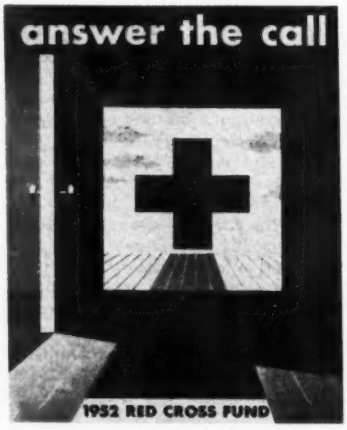
In most cement plants the white-hot clinker leaving the kiln is cooled for the purpose of heat recuperation. The introduction of quick air-quenching coolers has permitted the fixation of certain chemical compounds in the clinker. This has enhanced the quality of the finished cement, and has also improved the grindability of the clinker.

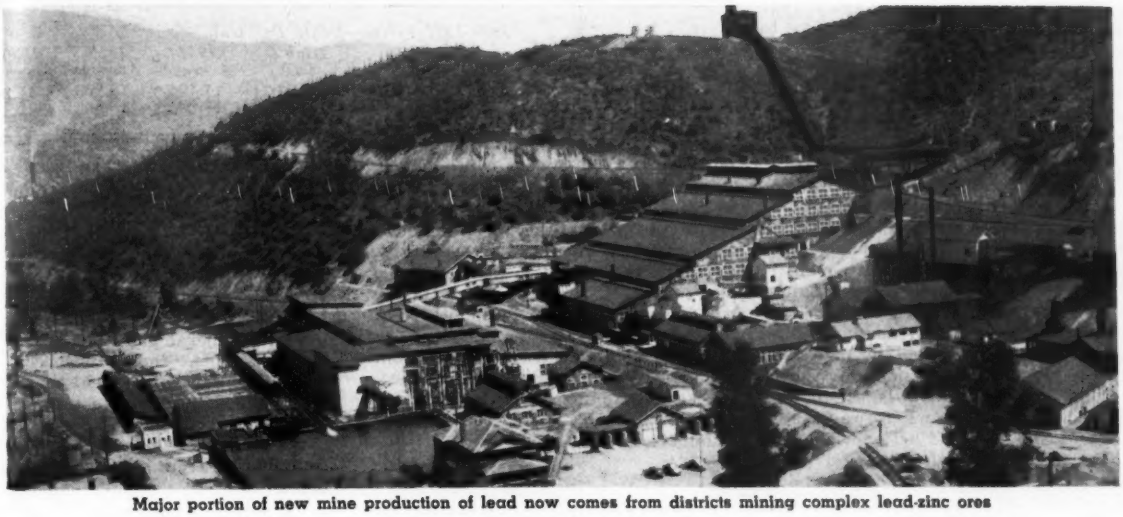
In the final grinding of the clinker into portland cement some plants have abolished the use of combination preliminators and tube mills (or compartment mills) and adopted the use of ball mills only, operating in closed circuit with air separators with very large circulating loads, up to 1000 percent. This system has also resulted in economies by removing the finished product more quickly from the mill and regrinding only the coarser particles.

A striking improvement in the transportation of cement inside the plants has been the invention of the air-slide system. In this system cement is aerated by low pressure air and made to flow by gravity through rectangular tubes.

In order to conserve raw materials, improve working conditions and be good neighbors, cement plants have expended large sums on improved methods of dust collection. Bag or mechanical cyclone type collectors, as well as electrical dust precipitators, have been installed.

Improvements such as these, and many others, have enabled cement producers to produce better and more uniform products, and to keep their costs at minimums. The economies obtained have been passed on to the public an important factor in keeping cement prices low.





Major portion of new mine production of lead now comes from districts mining complex lead-zinc ores

Zinc and Lead

Shortages Continue But With Stable Market Supplies Will Be Adequate

By OTTO HERRES
Vice-President
Combined Metals Reduction Co.

A WORLD-WIDE shortage of lead and zinc now is going into its second year. If defense demands continue heavy and increase as predicted by Washington officials zinc shortages probably will continue for another two years. Under such circumstances industry will be able to bring the supply of zinc into line with requirements before the end of 1953, provided that production is not restricted by Government regulations and controls and expansion projects requiring certification, allotments of material and equipment, and contracts for production are not delayed greatly by the defense agencies. When the Government assumes authority, as it has, to regulate industry by means of allocations, price controls, taxes and similar devices, it also takes over responsibility for shortages that may develop under these conditions.

Reports from Washington indicate that zinc requirements of the free world exceed refinery and smelter production by approximately 110,000 tons for the last three months of 1951.

Lead supplies are critically short in this country, but fairly adequate for requirements elsewhere. Relatively high prices may be expected to bring about a further improvement in world supplies during 1952. Lead is not considered a critical defense metal to the same extent as zinc and copper because large tonnages do not go directly into the production of weapons of war. For these reasons lead has not been placed under allocation at the International Materials Conference to the countries represented on the Copper-Zinc-Lead Committee which has been holding meetings in Washington since early last year.

Domestic Sources Stifled

During recent years the United States has obtained approximately two-thirds of its requirements of lead and zinc from domestic sources and imported the remaining one-third. Obviously, therefore, the most important source of zinc from the viewpoint of national security is production from domestic mines. But as late as 1950 many of the lead-zinc mines of the country were standing idle because metal prices were too low to cover the cost of operation, to say nothing of exploration for the new ore reserves needed to maintain production.

The principal factor in the decreased supply of lead and zinc for civilian use during the year 1951 was the lack of vision of Government planners in refusing to buy metal for the defense stockpile during 1949 and early 1950 when the mines were forced to curtail production and hundreds of small producers were shut down entirely. Washington demonstrated in 1951 the effects of weakening an industry that produces metals essential for national defense and civilian use.

DPA to Aid Expansion

The problem of meeting increased demands for zinc for military requirements, the strategic stockpile and essential civilian needs reached a crisis a little over one year ago, in November 1950. Defense officials in Washington wrote mine operators pointing out the gravity of the critical shortage of zinc metal in the United States and stated that the urgency of expanding domestic mine production could not be over-emphasized. A few months later scare buying, inventory building, substitution for more critical metals, higher foreign prices and increased cvilian demand caused a lead shortage of serious proportions.

Congress in the Defense Production Act of 1950, offered specific aids to the mining industry to expand its production of essential minerals and metals. Federal aid became available in the following forms:

1. Accelerated amortization to provide tax relief for new and expanded production.
2. Procurement contracts with a floor price and time period to be determined by negotiation.
3. Loans, provided private financing is not otherwise available on reasonable terms.
4. Matching funds for exploration work.

The Defense Production Act of 1951 continued governmental authority to make defense loans and long-term purchase contracts and broadened somewhat the powers to provide for subsidy payments on metals from high-cost sources.

1950-1951 Prices—Cents Per Unit						
	Beginning	Low	High & Last	1951 Average	1950 Average	1949 Average
Lead-Per Lb. New York	12.00	10.50	19.0	17.494	13.296	15.364
Zinc-Per Lb. St. Louis	9.785	9.75	19.5	17.994	13.866	12.144

Fast Tax Amortization Slow

Tax relief to protect and assure return of investment is an effective measure to encourage expansion of production. Accelerated tax amortization to mines, concentration plants, smelters, and refineries of zinc and lead involves relatively small liability to the Government and in fact may rather result in considerable long-range monetary advantages to the Government. It was hoped that prompt and realistic action would be taken to certify applications for projects helpful to the defense effort. But regardless of the urgent call that went out from Washington for expanded production, mining companies responding to the appeal waited many months for the certification and in some instances perhaps still are awaiting approval of projects important to the defense program.

DMPA to Buy Metals

The shallow and more accessible ore bodies from which zinc and lead were mined in past years have been exhausted or are being worked out in consequence of the heavy demand for these metals during World Wars I and II. Increasing industrial requirements, population growth and the world rearmament program now in progress are drawing heavily on developed resources.

New production must come to a large extent from deeper deposits, complex ores, and lower grade material. Extensive mine development and costly treatment plants are involved. Capital investment for the purpose under such conditions cannot be justified without assurance of market stability.

Procurement contracts are intended to provide this assurance to projects of merit capable of producing substantial new tonnages of zinc and lead for defense and essential civilian use. Assurance against wide fluctuations of price in competitive markets serves to encourage and greatly facilitate private financing of new projects.

Applications for purchase agreements were submitted to the Defense Agencies for a few relatively small zinc mining and milling projects notably in Tennessee and Wisconsin. After many months of negotiation a few contracts have been approved at market prices, or less, that will result in a very modest expansion of output.

Defense Materials Procurement Agency has reported three agreements to buy zinc—two with foreign mines and one in the United States. DMPA will buy up to 300 tons a month at 17½ cents per lb from American Zinc Co. of Tennessee from its new Jefferson County property. Volcan Mines Company of Lima, Peru, has an agreement covering 380 tons a month for three years at 17½ cents per lb. DMPA will buy up to 600 tons a month from National Zinc Co. The zinc will be produced at Bartlesville, Okla., from ore mined around Monterrey, Mexico. The aggregate investment by the three companies involved is reported to amount to some $1,540,000.

Few Loans Asked

Loans where private financing is not otherwise available on reasonable terms have had but little application to increase the supply of lead and zinc thus far. One loan of $400,000 to the Appalachian Mining and Smelting Co., at Embreeville, Tenn., has been reported. Another loan of $45,000 was advanced to the MacArthur Mining Co. for expansion of mining facilities near Baxter Springs, Kans., with an agreement that the Government would buy up to 1500 tons of slab zinc at 17½ cents per lb if the company cannot sell it on the market.

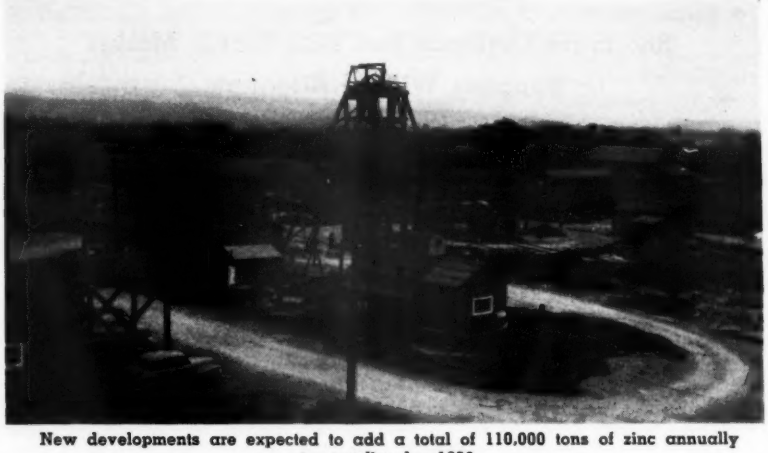
DMEA Program Valuable

In order to have peace, it seems that this nation must not only prepare for war but also help support countries unable or unwilling to support themselves. Preparation and foreign aid require increased production of the minerals needed for industrial purposes and to fashion the implements of defense. New sources of metals must be found and new supplies of minerals developed.

The National Minerals Advisory Council, appointed from industry by the Secretary of the Interior, reported to the Secretary:

> "It is understood that under the (Defense Production) Act the Government may make grants or loans to encourage exploration.
>
> "As a general principle, whenever possible, the funds contributed by the Government should be matched by private capital. The Government should be entitled to repayment of the amount of its contribution from successful ventures."

A Minerals Exploration Program taking the form recommended by the Advisory Council was approved and became effective in April, 1951. Rather than have the Government take over exploration for new ore reserves from private industry, Government loans are available to the prospector, small mine owner, and larger mining company with its technically trained staff, on a matching basis to be repaid when the project is successful.



New developments are expected to add a total of 110,000 tons of zinc annually to supplies by 1953

Applications are investigated by field teams of the Defense Minerals Exploration Administration made up of engineers from the Bureau of Mines and geologists of the United States Geological Survey. It seems evident from the short time the Exploration Program has been in effect that the investigations are afforded a measure of protection against loss of much time and money by avoiding useless effort on hopeless projects. The wealth of data and experience accumulated by the Survey in its regular program over the years has been of tremendous value to the Defense Exploration pro-

gram. Reports from exploration projects now under way point to a profitable outcome from the exploration effort.

International Controls

On October 1, 1951, the Copper-Zinc-Lead Committee of the International Materials Conference allocated zinc to the United States for the fourth quarter of 1951 at the annual rate of 1,007,324 short tons. This is about ten percent less than the estimated supply for 1951 available to the United States from domestic mine production including oxide, old scrap and imports.

For the first quarter of 1952, the allocation is approximately 252,426 short tons, or at the annual rate of approximately 1,009,700 tons.

The Committee has recommended that countries adopt measures to eliminate unessential consumption and encourage substitution by materials not in short supply. As such measures already are in effect in the United States, the prospect of obtaining a supply of zinc sufficient for our needs depends largely on the expansion of production by the mining industry.

New Mining Developments

Important projects under way for new and expanded production of zinc and additional tonnages anticipated by 1953 or earlier include:

	Year *1953*	
St. Joseph Lead Co.		
Balmat, N. Y.	13,400	tons
Herculaneum, Mo.	7,700	"
Indian Creek, Etc., Mo.	9,000	"
Universal Exploration Co.		
Jefferson City, Tenn.	9,000	"
American Smelting and Refining Co.		
Selby, Calif.	10,000	"
Corpus Christie, Tex. (Chihuahua, Mexico)	20,000	"
Van Stone, Wash.	10,000	"
Compania Minera, Guatemala	20,000	"
Cerro de Pasco Co., Peru	12,000	"

It is estimated that zinc from these sources available to the United States will amount to an additional 110,000 tons a year. The Herculaneum, Selby and Chihuahua projects are slag fuming plants.

Among the new projects now coming into expanded production are the Calumet and Hecla Co. property at Shullsburg, Wis., which commenced producing this year and will have an annual production of 15,000 to 18,000 tons of zinc and the Pend Oreille Mines and Metals Co., property at Metaline Falls, Wash., which also will produce approxmiately 18,000 tons a year. These properties and increased production from such operations as the Anaconda zinc mines in Montana and others will bring domestic mine production up from 623,375 tons in 1950 to approximately 680,000 tons in 1951 and a probable 730,000 tons in 1952.

Developments are under way to make the Pend Oreille district one of the big zinc producing areas of the country, and it is predicted from Montana that the Butte operation of Anaconda Co. will become the greatest producer of zinc in the United States.

New Jersey Zinc Co. has very extensive plans for increased production of ore under way, particularly at Ogdensburg, N. J.; Friedensville, Pa.; and in Colorado and Virginia, but it is reported that the increased production will replace ore lost when the Franklin ore deposit is exhausted in another few years.

Zinc exports of Canada to the United States are anticipated to reach 200,000 tons by 1953. Among the outstanding new properties is the Barvue mine in northwestern Quebec scheduled to commence producing this summer. Barvue will start shipping under a three-year 175,000-ton zinc concentrate contract with the American Zinc, Lead and Smelting Co., at the rate of approximately 40,000 tons of zinc (content) a year.

Peru also may be expected to become a greater source of zinc supply for the United States if the need continues. The ore bodies there are large, production is increasing and will be expanded substantially.

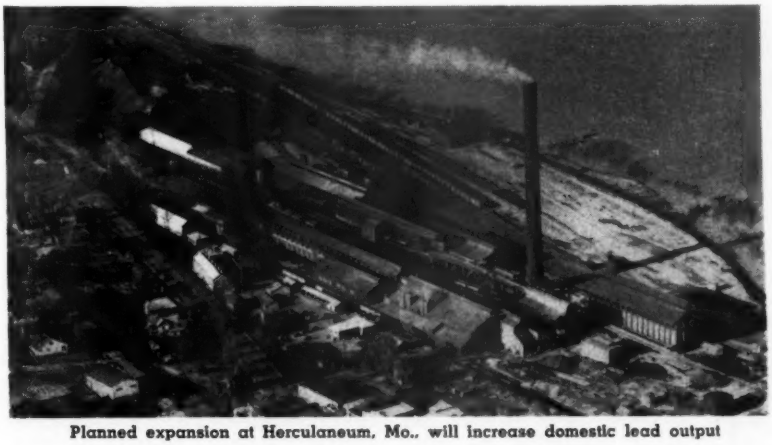
Lead Output Off

In the case of lead the only planned domestic expansion of considerable consequence seems to be the Herculaneum project of St. Joseph Lead Co. which will make possible an increase in lead production of 35,000 tons a year by 1954. The major portion of new mine production of lead in the United States now comes from districts mining complex lead-zinc ores in which zinc usually predominates. No great increase in domestic mine production of lead is anticipated other than that which results from increased production of complex zinc ores.

Mine production of lead for 1951 is estimated at 392,000 tons compared to 430,000 tons in 1950. The drop was caused largely by strikes and an insufficient number of miners in some districts. Indications are that mine production will approach the 1950 tonnage figure again in 1952 if labor troubles can be avoided. In fact it is quite possible that lead imports also will increase to the extent that lead shortages may disappear.

Milling, Smelting, Refining

Central milling and custom flotation plants for the treatment of complex lead-zinc ores are making possible large-tonnage mining of low-grade ores and greater use of underground mechanization. Improved metallurgy is responsible for better recoveries of the mineral values of low-grade and complex ores thus allowing mines to operate that otherwise would find it impossible under existing conditions of high wages and inflationary costs.



Planned expansion at Herculaneum, Mo., will increase domestic lead output

Horizontal retorts producing 40 percent of the country's zinc as Prime Western, are treating larger tonnages in larger furnaces and making higher metal recoveries. The latest development is the use of mechanical charging machines and the recovery of more by-products from retort residues.

The vertical retort process is continuous and smelts a wide range of zinc ores with high recovery. A new battery of vertical retorts and accessories in operation at the Palmerton plant of New Jersey Zinc Co. incorporates in the design new recuperators, autogenous cokers, and splash condensers.

A new electrothermic furnace is planned for operation at the Josephtown, Pa., plant of St. Joseph Lead Co. early in 1952. Longer furnace life, low cost and higher production are reported for the process and some continued improvement is expected.

The electrolytic process is particularly suited to the treatment of complex lead-zinc ores carrying consider-

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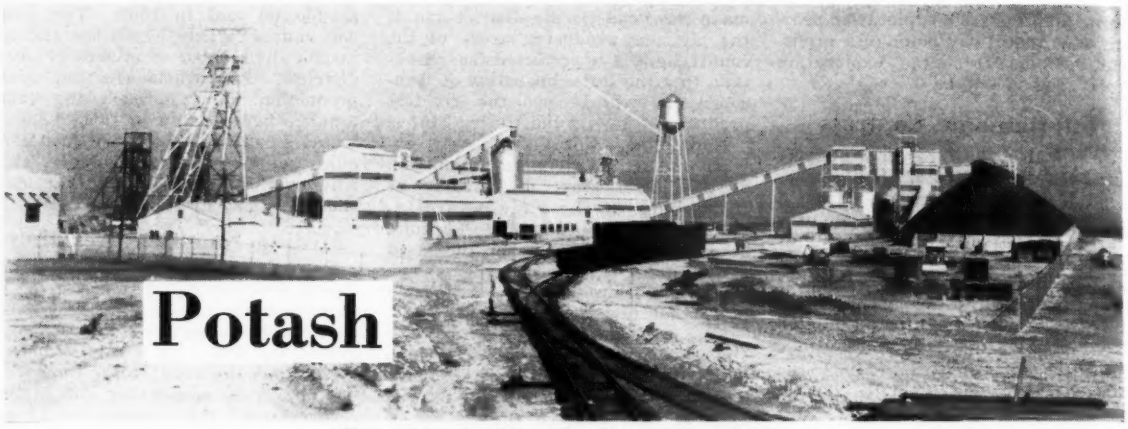


Potash

New refining facilities will add to 1952 production

Record Year Marked by Continued Expansion of Mining and Refining Facilities

By HORACE M. ALBRIGHT
President
United States Potash Co.

MINING of sylvinite and other potassium-bearing ores from beds approximately 1000 ft below the surface of the land east of the Pecos River in New Mexico is the chief source of potash in the United States. Extraction is on the pattern of the room and pillar system, employing the most modern mining equipment.

The mining companies in full operation in 1951 were the International Minerals & Chemical Corp. Potash Company of America, and United States Potash Co. The latter, oldest in the New Mexico field, will complete in 1952 its 20th year of full operation with both mining and refining facilities. Two new mining companies—Duval Sulphur & Potash Co. and Southwest Potash Corp.—will be in production in 1952.

Two other companies produce potash from brines; one is American Potash & Chemical Corp., which has its plants at Trona on Searles Lake, Calif., and the other is Bonneville, Ltd., in western Utah, where concentration is partly by solar evaporation. Fully 85 percent of all potash produced in the Western Hemisphere comes from the New Mexico mines.

Production and Distribution

The upward trend in deliveries of potash in North America which has been evidenced every year since 1939 (with the exception of the year 1949 when deliveries were seriously affected by a strike at the plants of the three Carlsbad producers) continued during 1951. This was a record year during which deliveries totaled approximately 1,650,000 tons K_2O as compared to 1950's previous record of 1,465,599 tons. Once again the domestic producers substantially increased deliveries, although imports from Spain, France, Western Germany and the Eastern (Russian) Zone of Germany accounted for approximately 250,000 tons of the total against 210,381 tons K_2O in 1950. The accompanying chart gives striking evidence of the importance of the contribution of the domestic potash industry to the welfare of our country. In 1940 deliveries by domestic potash producers totaled approximately 382,000 tons K_2O and in 1951 these same producers supplied nearly 1,400,000 tons.

Greater Production Ahead

Still further output is anticipated in 1952 with the advent of two new potash producers in the Carlsbad, N. M., basin. The first of these, Duval Sulphur & Potash Co., shipped its first carload of muriate of potash in December 1951 and should be in full production early in 1952. Southwest Potash Corp., a subsidiary of American Metals Co., Ltd., will be in production before the end of 1952.

The domestic producers of potash once again marketed five grades for agricultural purposes and two high analysis grades for the chemical industry. As in previous years, agricultural users accounted for approximately 95 percent and the chemical industry received the remaining five percent. This proportion does not vary much from year to year, but agricultural usage has increased at a slightly faster rate than chemical.

The agricultural grades were 60-63 percent K_2O muriate of potash, or about 95-99 percent potassium chloride; 50 percent muriate of potash which is about 79 percent pure potassium chloride; manure salts (run-of-mine ore) averaging between 20-26 percent K_2O; sulphate of potash which analyzes around 50 percent K_2O, and sulphate of potash magnesia analyzing about 22 percent K_2O and 18.5 percent MgO.

The chemical industry was supplied with a technical grade of potassium chloride running between 99.5 and 98.9 percent KCl and also a commercial grade similar to the high grade agricultural product, running between

Eight shaft sinking projects were only part of activities in Carlsbad, N. M., area

98.5 and 99 percent KCl. Some sulphate of potash was used by the chemical industry and the smelting industry also made use of a very small tonnage of manure salts in the preparation of fluxes.

The trend toward higher grades of potash continued in 1951 with over three-fourths of the total agricultural potash coming from the 60-63 percent K_2O muriates; approximately 16 percent of the total from the 50 percent muriate, and a markedly decreased percentage from the lower grade salts. Factors influencing this change are the relatively lower cost per unit of potash delivered in the more concentrated forms, increased demands for higher analysis fertilizers, and increased refining capacities of the domestic producers.

Agricultural Uses Increase

The long-term outlook for the potash industry continues to be favorable and 1952 should be another year of increased deliveries to consumers. The major long-term factor calling for increased usage of fertilizers and potash is the steady growth of population resulting in increased demands for food and fibre from fewer acres per unit of population. Coupled with this are such factors as increasing depletion of our soil resources, less farm labor and the widespread dissemination of information regarding the physical and financial values of increased fertilizer and potash application. New territories for fertilizer usage are being opened up in the Great Plains states and the states of the southwest. Usage in the Corn Belt continues to increase and the depleted soils of the southeast continue to require large quantities of plant food.

Increased demand for potash by agriculture has been the dominant factor in the growth of the domestic potash industry. Agriculture has been called on to produce more at a time when less labor was available and costs were increasing. Increased efficiency was the farmer's answer to this problem and greater use of fertilizers was necessary for accomplishing this end.

Tribute is paid at this point to the very excellent work done during the past year, as in previous years, by the American Potash Institute, which is maintained by the American Potash & Chemical Corp., Potash Company of America and United States Potash Co. Through research fellowships maintained at many agricultural colleges and experiment stations in the United States and Canada, publications and films, the institute continues its efforts to help farmers find out how and where potash fertilizers can be used to best advantage. Its achievements have been of incalculable value to the potash industry, as well as to fertilizer manufacturers and the farmers of the United States, Canada and Cuba. It is an outstanding research establishment operated by agronomists of highest attainments in modern agricultural sciences.

High goals have been set for agriculture in 1952 and the farmer is fairly well assured of disposing of his product at satisfactory prices. It is therefore reasonable to anticipate that the potash industry will enjoy another record year in 1952.

Report Major Improvements

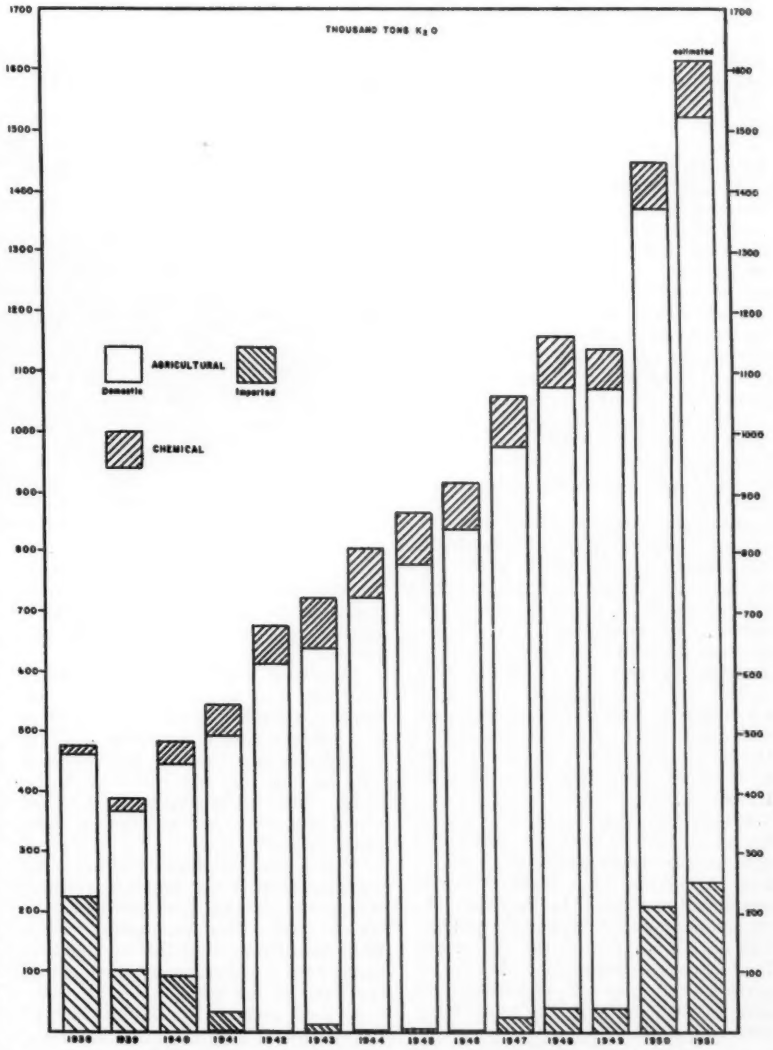
According to reports made by officials of all producing companies, the year 1951 was also a record year in terms of new construction commenced or completed with the individual projects ranging from major installations, such as new shafts, to smaller plant additions and changes which are designed to increase efficiency and maintain maximum output throughout the industry.

At International Minerals & Chemical Corp. the third shaft was completed and sinking begun on a fourth shaft during 1951, according to A. Norman Into, vice president and head of this company's Potash Division.

According to Into, the major development at the properties of International Minerals & Chemical Corp. is the work being done toward the opening of a large ore body on their lease property. This body of ore, a major extension of existing workings, will commence supplying ore toward the middle of 1952. One shaft, called No. 3, was completed during the fall.

POTASH DELIVERIES – AGRICULTURAL & CHEMICAL

NORTH AMERICA



Industry continues upward trend with record 1,650,000-ton deliveries

A fourth shaft is in the process of sinking and should be completed in the spring of 1952. Conventional track haulage from the new area to the No. 1 hoisting shaft will be all underground. The new shafts will be used for ventilation and men and supplies. No major changes in plant have occurred during the year; however, continued work toward refinements in process and equipment has resulted in some improvement in recovery.

The company published late in the year a very attractive and highly informative booklet, entitled "Potash An Essential Mineral."

President G. F. Coope, Potash Company of America, advises that new construction involving a total capital expenditure of approximately $2,750,000 has been completed and included the following:

A plant, on which construction was commenced in 1950, was put into operation in early 1951 at Dumas, Texas. This additional facility will use muriate of potash from the Carlsbad operation to produce potassium sulphate and hydrochloric acid.

At Carlsbad, flotation capacity was brought into balance with the addition of new type flotation cells and a 250 hp Wickes automatic boiler was added to the steam plant. The cells and the boiler were outdoor installations.

Improvements were made in the chemical grade KCl plant at Carlsbad to provide an increased tonnage of substantially chemically pure potash.

Work was completed on the installation of a new Nordberg 3200-hp diesel engine for power generation and a fifth warehouse for storage of potash products was built.

Improvements were made to existing mine equipment as well as the addition of new mining equipment, which included two Joy continuous mining machines.

In addition to the above new construction and major capital additions, the sinking of the South Shaft continued on schedule and had reached a depth of 700 ft at year's end. Total depth is to be 800 ft. The freezing process adopted for sinking proved satisfactory and no particular difficulties were encountered. This process, used in Europe, had never been used previously in shaft sinking in the Carlsbad area. It was the subject of an interesting paper * written by Russell G. Haworth.

During the past year the United States Potash Co. has undertaken three major construction projects, as well as making other installations of equipment designed to increase efficiency and obtain maximum production in all phases of the operation. This program represents the major portion of a planned expenditure of over $4,000,000 during the years 1951, 1952 and 1953.

The major construction projects, all of which were started during 1951, are as follows:

(1) A new general office building in the city of Carlsbad;

(2) The installation of additional refinery equipment to improve recovery and slightly increase production, and to provide standby facilities to safeguard production from loss through breakdown. The contractor for this project is C. C. Moore & Co. Engineers of San Francisco;

(3) Sinking of a new 1300-ft, circular shaft, 15 ft in diameter, to be used for additional ventilation and for servicing of the northern mine development. No. 3 shaft is to be located approximately six miles northeast of the present No. 1 shaft. The firm of Winston Bros., Minneapolis, Minn., is the contractor for this project.

Freezing method stopped quicksand flow to permit sinking PCA shaft

H. H. Bruhn, resident manager, reports the following new equipment installed or put into general service during the year in the various departments:

Industrial radio phone equipment was put into service with fixed stations in Carlsbad, at the mine, and at the refinery, and with mobile stations installed in a number of the company vehicles and on the company tramroad. This equipment is being used for dispatching and emergency communications.

A new Stearns-Roger 2-drum hoist equipped with a 275 hp-General Electric motor was put into service at the No. 2 shaft. This equipment, with a 90-ft headframe installed in 1950, is being used for auxiliary hoisting and servicing of the mine.

A new Jeffrey Aerodyne fan of 150,000 cu ft capacity was installed near the foot of the No. 2 shaft in order to improve ventilation. Mine ventilation has been so arranged that a fan on the surface can be put into immediate service should the underground fan be down for any reason.

A diesel bulldozer was put into regular service for underground track fill and backfilling operations.

A diesel powered trailer truck was designed and built in the company shops and put into service underground for use on development work. This machine has a capacity of 15 tons and will travel at speeds up to 18 mph. Additional loading machines, shuttle cars, drills and other mining equipment were purchased and put into service underground.

Change Blasting Practice

Two hydraulically operated boom mounted drills on rubber-tired carriages were put into service for the drilling of shot holes.

Portable battery equipped capacitor type blasting machines were put into use for shot firing, replacing the former practice of carrying blasting power lines and shunt switches forward as mining advanced. Improvement in blasting practice with the use of smaller holes and smaller diameter dynamite was also initiated during the year.

Carrier current trolley phone equipment was installed on underground locomotives in order to increase safety and to speed up tramming operations.

A new 12,470-v power distribution system for underground use was installed during the year.

At the granular plant a new conveyor belt and slurry pump distribution system were installed to carry tailings from the plant to the tailing dump. Additional bagging and material handling equipment for finished product was installed at the refinery. An American Blower Corp. Rotoclone wet dust collector was installed in the finished product handling unit for

* Apply Freezing Method in Potash Field, MINING CONGRESS JOURNAL, Jan., '52.

better dust control. Ion exchange water softeners were charged with one of the new plastic type synthetic softening agents resulting in considerable increase in refining efficiency.

Operate at Capacity

American Potash & Chemical Corp. produces potash, as well as many other chemicals from the brines of Searles Lake, Calif. D. S. Dunsmoor, vice-president, reports no changes during the past year in potash operation, although production was at capacity throughout the year.

William L. Bradley, president of Bonneville, Ltd., which produces potash from brines near Wendover, Utah, advises that new development work at their properties during the year included the completion of eight wells to obtain brine from around the 1200-ft level. Electrification of the pumps on these wells and the primary canal pumps was completed and required the installation of about 10 miles of power lines. In order to supply the increased amount of electrical power needed an addition was made to the present power house and an 800-hp slow-speed diesel engine and generator were installed. Equipment purchased included three DW-10 diesel-powered Caterpillar Wagons of 20-ton capacity to be used in hauling crude potash salts from the field to the mill.

New Producers in Field

One of the new additions to the industry, Duval Sulphur and Potash Co., has been sinking shafts and constructing surface facilities in the Carlsbad area since July, 1950. George F. Zoffman, president, reports that shaft sinking progressed satisfactorily from a depth of approximately 585 ft for both No. 1 and No. 2 shafts on January 1, 1951. No. 2 shaft, including the mining level station and sump, was completed at a depth of approximately 1420 ft and turned over to the company by the contractor on December 10, 1951. No. 1 shaft is still under construction and it is estimated that all work to be performed by the contractor will be completed during January, 1952. Erection of a permanent hoist, headframe and crude-ore bin for this shaft has been completed and this equipment will be moved into permanent locations upon removal of the sinking equipment, and No. 1 shaft will then be put into service as an ore-hoisting shaft.

The actual shaft sinking during the year involved grouting the Culebra water zone which occurred in each of the shafts at a depth of from 640 to 680 ft. The grouting was done from stations cut in the shafts at a depth of 580 ft. Approximately 20,000 sacks of cement were used and the months of January and February were required for completion of this phase of sinking.

Ore refining to produce only high grade muriate of potash will be by flotation process. Surface refining facilities, including the crushing plant, refinery storage, loading and shipping facilities, ore bins and conveyors, were practically completed during 1951, as was other auxiliary construction, such as the plant office, change house, hoist house, supplies warehouse, laboratory and explosives magazine.

Sylvinite ore brought to the surface during the excavation of mining level stations was started through the crushing plant and into the refinery circuit for brine preparation on November 8, 1951. A 60 percent K_2O muriate of potash was first produced on November 28, 1951, and the first railroad car of this product was shipped to market on December 8, 1951. All ore now being produced in connection with preliminary mine development is being refined into finished product.

The second new company in the Carlsbad area, the Southwest Potash Corp., while commencing shaft sinking and related surface construction at a much later date than Duval Sulphur and Potash Co., reports excellent progress.

According to John Payne, Jr., chief mining engineer of the parent company, plant construction and shaft sinking were carried on continuously during 1951. Initial production is expected during August, 1952, at an annual rate of approximately 185,000 tons K_2O. The plant has been designed to be readily expanded to a larger tonnage.

Two circular shafts, 15 and 20 ft in diameter, had passed through the upper formations and were being sunk in the salt horizon at the end of the year.

Flotation will be used to separate the sylvite from the salt in the ore.

Mechanical Coal Mining

(*Continued from page* 45)

Power supply cables are becoming so large and unwieldy, that either extra man power will be required to handle them or considerable productive time losses incurred. Only limited use has been made of sectionalized cables up to the present time.

Other Problems Important

Other problems of the industry, just as important perhaps as those already mentioned, but not holding the spotlight, were by no means ignored.

Ventilation, profiting considerably from roof bolting and its attendant reduction in frictional resistance, also derived benefits from the use of roof sealing compounds applied to stoppings. Pneumatic, collapsible stoppings made their appearance and were given limited trial.

Plastic and aluminum pipe with improved couplings have found a definite place in the drainage economy.

Mine lighting, face illumination particularly, lags far behind lighting advances in other industries, which have recognized the advantages of better lighting and visibility, improved morale, greater safety and efficiency. However, improved cap lamps, battery powered portable floodlights and extensible light lines of rugged construction are available.

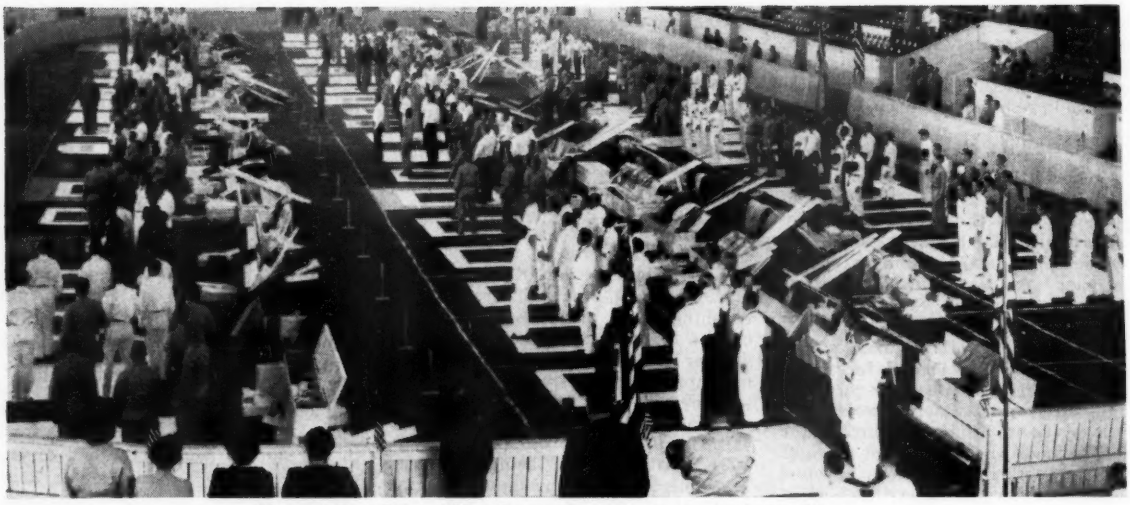
Application of the electric eye and the television screen to surface and underground operations with opportunities for remote control, may emerge from the planning to the testing stage during 1952.

Coal dust, a "by-product" of the industry, has been the cause of much concern all the way from the working face to the consumers storage bin. It has been combatted through the years with the aid of water, oil and a variety of compounds. Foreign countries, notably Great Britain, have devoted much time, effort and money to discover ways and means of overcoming this handicap. Collecting devices to confine and gather this dust at its source, namely the working face, were designed, built and tried during the year. Results were promising and field tests are to be continued.

Degasification of coal seams in advance of mining, long dreamed of and attempted at various times during the past 25 years, may be nearer a practical solution by virtue of progress made in the actual collection and utilization of methane in mining operations in Belgium, Germany and Great Britain. Elimination of this catastrophe hazard, peculiar to coal mining, could easily prove to be one of the most notable achievements of the industry.

Continued prosperity of the industry can be assured only by its willingness to accept the new techniques and equipment offered and explore their merits to the fullest extent. Management must appraise and diligently plan its operations and select and train its workers in the correct and efficient use of the tools entrusted to their care.

The coal mining industry can take pride in progress made during 1951, a year which marked the beginning of a new era of confidence in itself, in its future in relation to the United States and world economy, and in its ability to stabilize its labor problems and to meet any and all demands placed upon it. A new horizon has been proclaimed—a billion ton year for coal in 1975.



National First Aid and Mine Rescue Contests were revived after 20 years

Mining Safety in '51

Mines are Becoming Safer Working Places But There Is Still Plenty of Room for Improvement

By J. J. FORBES
Director
United States Bureau of Mines

INJURY experience in mines and quarries in 1951 was not as good as in 1950, owing primarily to the major disasters in the coal-mining industry. As gaged by injury rates estimated from incomplete reports, fatality experience was less favorable and nonfatal injury experience was slightly improved in 1951.

In general, mines and quarries were operated at a higher level of activity, and total man-hours of work are estimated to have gained about eight percent in 1951. This increased worktime and the major disasters resulted in a substantial increase in the number of injuries.

The number of fatalities in 1951 is estimated to have risen to a total of 940, or 169 more than in 1950. The fatality rate is tentatively placed at 0.82 per million man-hours as compared with 0.73 in 1950.

The estimated total of nonfatal injuries was 51,750, a gain of roughly 3000 over 1950. However, the tentative frequency rate of nonfatal injuries was improved to 45.41 per million man-hours, slightly below the corresponding rate of 46.30 in 1950.

At coal mines, 800 fatal and 39,500 nonfatal injuries are estimated to have occurred, both substantially higher totals than in 1950. The fatality rate of 1.04 per million man-hours in 1951 represented a 16 percent increase over 1950. However, the nonfatal injury rate of 51.32 was slightly better than the corresponding rate for 1950, owing to the greater work time.

Five major disasters—all explosions of gas or dust—occurred in coal mines during 1951. The four disasters in soft-coal mines killed 152 men, and the one in an anthracite mine killed five. The December 21 explosion in the Orient No. 2 mine at West Frankfort, Ill., was by far the most serious; 119 men were killed in this disaster. The mine explosion on January 18, 1951, was the first major disaster to occur in coal mines since November 4, 1948, a 25-month disaster-free period.

At bituminous-coal mines it is estimated that 700 fatal and 31,500 nonfatal injuries occurred. The tentative fatality frequency rate of 1.07 was higher than in any year since 1948, when the comparable figure was 1.15. Also, the estimated rate of 48.11 nonfatal injuries per million man-hours was less favorable than the 1950 rate of 47.83.

In the anthracite mines of Pennsylvania, it is estimated that there were 100 fatal and 8000 nonfatal injuries during the year. The frequency of the fatalities was roughly 0.87 and of the nonfatal injuries 69.56 per million man-hours. This fatality rate was higher than in any year since 1948. However, the nonfatal injury frequency was improved over 1950.

Injury frequency rates per million man-hours in mines and quarries of the United States, 1947-51 (Data for 1950-51 are preliminary)

	Coal Mines		Metal Mines		Quarries	
	Fatal	Nonfatal	Fatal	Nonfatal	Fatal	Nonfatal
1951	1.04	51.32	0.56	42.80	0.23	25.07
1950	.90	51.94	.58	45.01	.23	25.37
1949	.91	55.11	.48	48.07	.36	26.48
1948	1.11	59.53	.64	47.25	.42	27.88
1947	1.22	60.72	.80	52.81	.44	32.00

Metal Mines Improve Record

Injury experience in metal mines was better in 1951, and both the fatal- and nonfatal-injury rates were improved. The frequency of fatalities was reduced to 0.56 and that of nonfatal injuries was reduced to 42.80 per million man-hours. However, owing to the increased work time, the actual number of fatalities is estimated to have increased to a total of 94—seven more than in 1950. Also, the number of nonfatal injuries increased approximately 400 over 1950.

The safety record of quarries in 1951 was virtually unchanged from that in 1950. The frequency rate of fatalities in both years was 0.23 per million man-hours. Nonfatal injury experience was improved slightly and the frequency rate was reduced to 25.07 in 1951 from 25.37 in 1950. However, owing to the sharp rise in operating activity the numbers of fatal and nonfatal injuries are estimated to have increased, respectively, four and 400 in 1951.

A measure of safety progress is the number of certificates awarded by the Joseph A. Holmes Safety Association to the mineral industries for outstanding safety achievements in 1950. The total of 313 awards granted is the greatest number ever given by the Association. The awards were distributed as follows: 82 to coal mines, 79 to metal mines, 46 to the petroleum facilities, 19 to nonmetallic mines, and 87 to individuals.

Revive National Contest

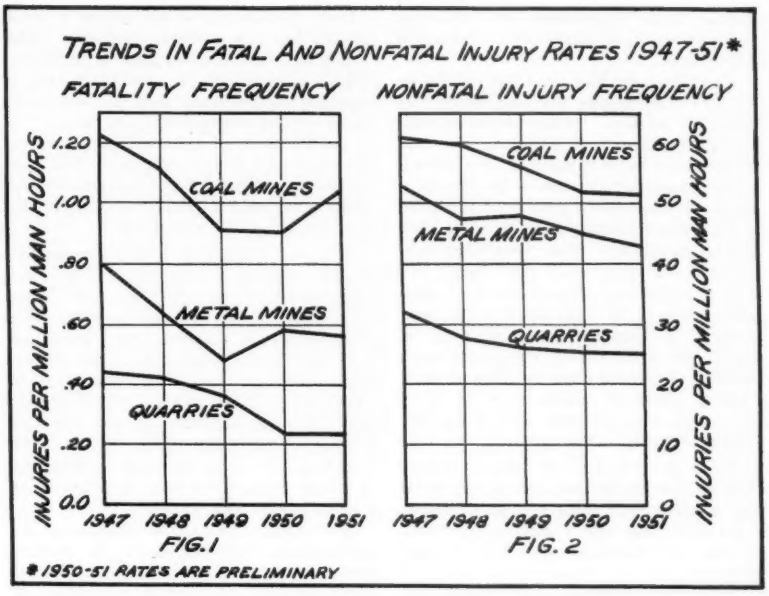
National First-Aid and Mine Rescue Contests were revived after a lapse of 20 years, the last meet being held in Louisville, Ky., in 1931. Fifty-five teams competed in the most recent first-aid contest and 14 in the mine rescue contest. The number of teams participating and the enthusiasm displayed by team members were ample proof of the contest's success.

In the transportation field, diesel equipment has been playing an ever-more-important role in the non-coal mining industry. Fifteen years ago a few diesel trucks were used in some tunnel construction; but today diesel locomotives, trucks, and loading machines are used in over 50 mines throughout the United States. USBM engineers have cooperated with state officials in drawing up safe operating regulations and in sampling atmospheres where such equipment is used. Experimental work has proved that diesel equipment can be operated and maintained in safe condition; but, like any mechanical or electrical equipment, it cannot be neglected by the operator. Diesel equipment is well-suited to modern mining methods, and such units have the power necessary to meet present production demands. Schedules have been established by the U. S. Bureau of Mines which permit testing of diesel equipment to insure its suitability for underground use.

Progress in health and safety in nonferrous processing plants has been made along the following preventive lines: (1) Industrial hygiene, (2) dust control, (3) use of protective clothing and equipment, and (4) guarding machinery.

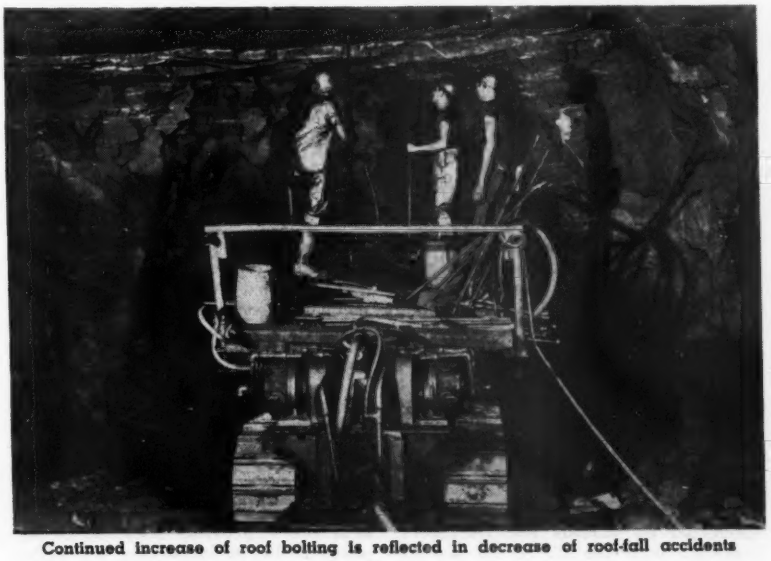
Industrial hygiene is one of the most recent fields in which progress has been made at mills, smelters, refineries and reduction plants. In some instances an industrial hygiene department serves a single plant, but generally they are centrally controlled and serve all plants operated by a company. The responsibilities of the department are to make dust, fume, gas, ventilation, and sanitary surveys, with recommendations for improving working conditions. These surveys sometimes result in the reconditioning of old equipment or the installation of new; the proper maintenance and operation of equipment installed; more frequent and thorough test of blood and urine and general physical examinations.

Due to progressive inundation of abandoned anthracite mines, an engineering survey is being conducted to determine remedial measures for recommendations to Congress. This survey is a cooperative project, with assistance from the mine operators and the State. A long-range program to benefit the entire region is necessarily too large a project for any one organization to undertake.



Study Roof Control

Since the beginning of mining, falls of materials from the roof or back have constituted well over 50 percent of the total underground accidents. To combat this hazard more effectively, a Roof-Control Section was organized within the Bureau of Mines in 1948 to engage in research on the subject and to provide service to indi-



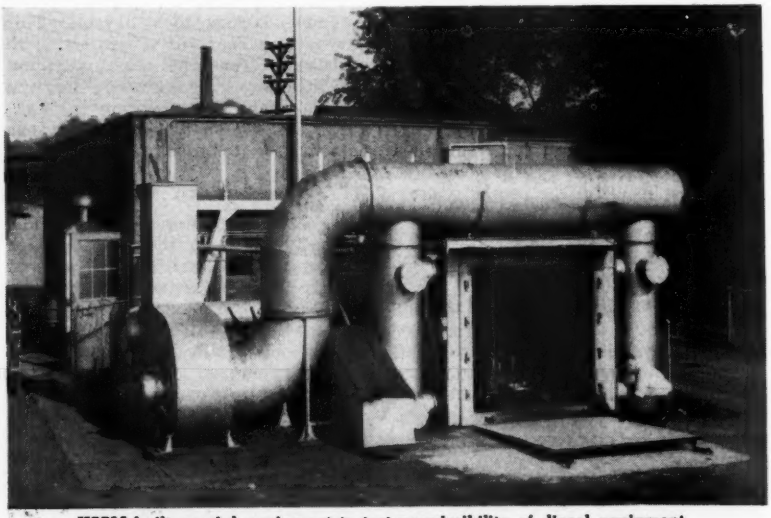
Continued increase of roof bolting is reflected in decrease of roof-fall accidents

vidual mine operators in assisting them in working out their roof-control problems.

Roof bolting has now proved to be an effective means for combating the roof-fall hazard. Many experimental installations in both coal and non-coal mines have been sponsored and knowledge is keeping abreast of the development in laboratory and field research work. Roof bolting is even more generally applicable than was first suspected, with the result that today 570 mines are using this method of support, and it is estimated that roof bolting is increasing at a rate of 40,000,000 sq ft of roof supported each month. Accident reports from several States, notably Alabama and West Virginia, are already reflecting the results of this development.

Other activities of the Roof-Control Section are investigations of the mining method that causes coal to burst from the face and research on roof-control in longwall systems of coal mining.

Equipment testing was directed toward improving safety in coal and other mines in the following ways: (1) Investigation of new types of electrically operated machines and appliances to determine whether their construction would minimize gas and dust ignition hazards as well as hazards of electric shock; (2) investigation of mine locomotives and other equipment driven by diesel engines for safety of operation in mines; and (3) research to determine cause and prevention of accidents resulting from men working with or around mining equipment.



USBM built special equipment to test permissibility of diesel equipment

Investigative work consisted largely of inspections and tests to determine whether the machines and appliances submitted by various manufacturers complied with the U. S. Bureau of Mines standards ("schedules") that prescribe the safety features that must be built into mining equipment. Such compliance is necessary before equipment receives formal approval authorizing operation in mines.

At the time of this writing, investigations had been completed and approvals granted by the Bureau for 53 machines and appliances under the provisions of 10 schedules.

Three of these are of especial interest, as they represent the first approvals to be granted for these particular types of equipment. The diesel-electric shuttle car was approved for use only in non-coal mines. The principal safety feature of this shuttle car is its design, which limits the toxic constituents of the exhaust gases to amounts that will not be harmful for mine workers to breathe. A diesel locomotive was approved for use in gassy coal mines.

For many years the Bureau's requirements for approval of motor-driven machines were not considered rigid enough to permit approval of mine locomotives and shuttle cars operated from cable reels. Accordingly, the requirements were officially amended in October to include additional safeguards. Three cable-reel shuttle cars were the first to be approved under the more rigid requirements. Thus, a new type of permissible equipment has become available to the coal-mining industry.

See Better With Rock Dust

Installations of experimental mine-lighting systems were studied in connection with efforts to improve underground illumination. With approximately 95 percent of the light absorbed by the coal faces and ribs, the greatest field for improving illumination appears to lie in increasing the reflectance of these dark surfaces by whitening them with whitewash or rock dust.

Research work has shown that misfires in multiple blasting of coal with electric blasting caps are not likely to occur if enough current is put into the firing circuit. The prevention of misfires thus becomes largely a matter of using a blasting unit of adequate capacity.

Under joint sponsorship of the American Mining Congress and the Bureau of Mines, a new "American Standard Safety Code for Installing and Using Electrical Equipment in and About Coal Mines" was completed. This is to be published shortly by the Bureau of Mines. Revision of the corresponding standards for metal and nonmetal mines has been started.

States Revise Safety Laws

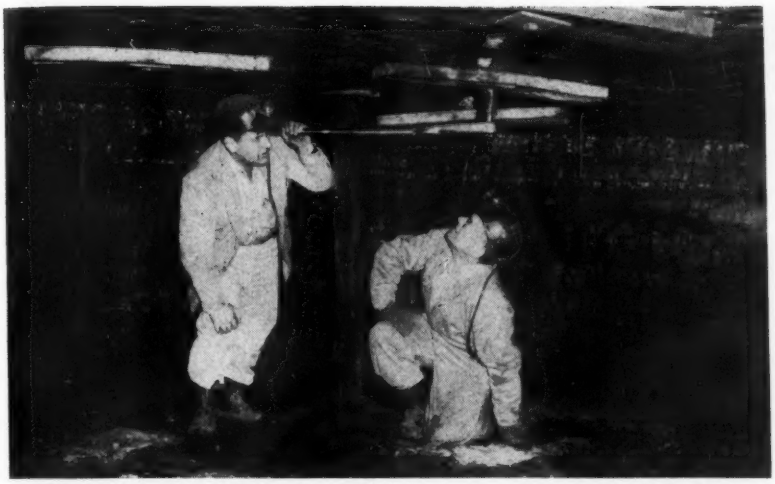
One noticeable safety improvement has been the trend toward better state mine safety laws and better enforcement of state legislation. During 1951 the coal-mining laws of Colorado, Tennessee, and Wyoming were revised by the respective state legislatures, and the regulations in these states now compare favorably with the best in the country.

During 1951 approximately 9500 coal-mine inspections and investigations were made by the Federal coal-mine inspectors; 3500 mine officials and 15,000 mine employes attended training courses in accident prevention. Approximately 600 on-the-scene investigations of fatal accidents were made by Federal inspectors.

The study and analysis of detailed investigation reports of fatal accidents and the publications of these studies furnish the industry, for the first time, with authentic current and nation-wide information on the causes of mine accidents. Use of this information by State and Federal inspectors, company safety engineers and inspectors, mine safety committeemen, and management officials will have substantial value in their efforts to prevent accidents.

Educational Meetings Held

Recognizing that falls of roof, face, or rib are responsible for more than half of all coal-mine fatalities and mine-haulage operations for more than one-fourth of such fatalities, the USBM has concentrated much of its efforts during the year on these causes. An innovation in this connection is the special short course or safety meeting conducted by the Federal coal-mine inspector when he concludes inspection of each mine. During the inspection of a mine the inspector requests a meeting of all haulage employes, supervisory officials, and mine safety committeemen. At the meeting he delivers his message, consisting mainly of information obtained from



Constant checking with torque wrench helps insure safety in roof bolted mines

the study of fatal accident investigation reports, and encourages and leads group discussion of the subject matter. A similar session is held on the subject of roof-fall hazards, which all employes and supervisory officials are invited to attend. Fair success in this program was attained. The program was initiated about the middle of the year, and since that time approximately 30,000 mine employes and supervisors have participated in the mine-haulage meetings and about 50,000 in the roof-fall sessions. This direct approach to mine workers and supervisors is the only effective way of supplying them with this essential information.

Important developments related to safety are noted in the coal-mine-equipment field. Among these a diesel locomotive was approved for use in coal mines, making possible elimination of certain personnel and fire hazards. The permissible diesel, if properly maintained, will not ignite gas and may be operated safely in return air.

Another important development is an amended schedule to provide for testing and approving cable-reel locomotives and shuttle cars. During the year, the first permissible shuttle car was approved by the Bureau. It is anticipated that several cable-reel locomotives will be approved.

Health activities included significant work on gases and dusts, the approval testing of respiratory protective devices, and studies of the fundamentals of mine ventilation. These four organized fields of study and investigation provided a means for handling a variety of problems relating to industrial hygiene applicable to the mining and mineral industries.

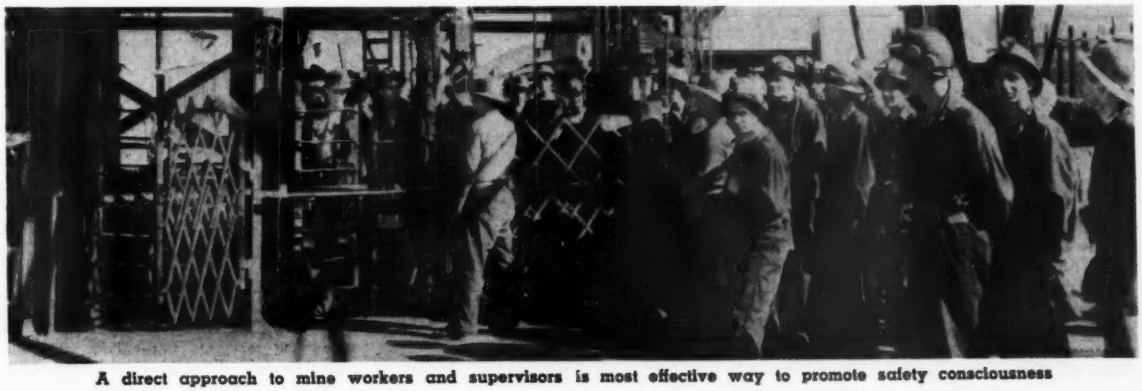
Part of the work on gases consists of analyses of samples of mine atmosphere collected in connection with investigations relating to mining operations. Some 15,000 to 17,000 samples of mine air are analyzed annually, providing information on the effectiveness of mine ventilation, detecting and evaluating hazards from flammable and toxic gases, aiding in the control and extinguishment of mine fires, and supplying information in various special investigations.

Some current research relating to gases included study of the products of thermal decomposition of synthetic materials used as electrical insulation; study of the ignitibility and decomposition temperatures of conveyor belting used in coal mines; investigation of the spontaneous combustion of carbonaceous pyritic slates encountered in certain mining operations; examination of carbon deposits from air compressors to determine their tendencies toward self-ignition; and examination of materials suggested for use in coating coal-mine roof to prevent spalling or weathering. Numerous field investigations of hazards or accidents caused by gases were conducted.

Advocate Dust Collectors

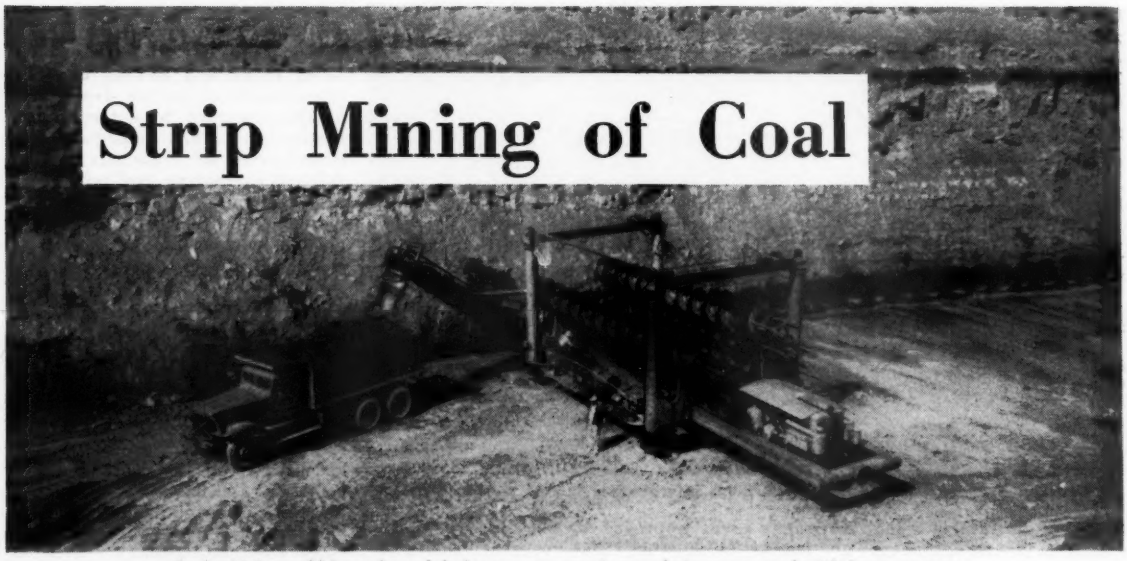
Introduction of roof bolting in coal mines has brought with it the problem of controlling the dust from the drilling of holes for bolt installation. Since wet drilling is not well-suited to coal-mining operations, the USBM has encouraged development of dry dust collectors and has aided the manufacturers of this equipment by testing working models and offering suggestions for improvement. After considerable research during the year, a schedule for testing dry dust collectors for permissibility was developed. Several collectors, submitted for testing, will come well within the approval requirements. The work on dust during the past year included examination of some 1600 samples collected in mines and plants to determine concentrations and particle-size distribution of air-borne dusts and the composition of dusts and dust-source materials.

Approval testing of respiratory protective devices, such as industrial gas masks, dust respirators, supplied-air respirators, and "chemical cartridge" respirators, assures that adequate equipment will be developed to meet the needs of the industry and also aids the manufacturers in developing such equipment. During the past year nine new approvals and 34 extensions of approval, covering minor changes in design of previously approved equipment, were granted. In addition, numerous check tests were made of approved respiratory protective equipment purchased in the open market.



A direct approach to mine workers and supervisors is most effective way to promote safety consciousness

Strip Mining of Coal



Coal which would have been left three years ago is now being recovered with large augers

Year Marked By a Slight Falling Off In Production And Advances in Technology

By DAVIS READ
Consulting Engineer
Chicago, Ill.

PRELIMINARY estimates place production at 118,000,000 tons of strip mine coal (bituminous and lignite) in 1951. This is 22.1 percent of the estimated total production and compares with 123,000,000 tons or 23.9 percent of total in 1950. This decrease, tonnage-wise and percentage-wise, indicates a leveling off and a return to normal operations rather than a slump. There were no serious interruptions in stripping operations because of labor troubles but acute car shortages occurred in some fields. The pattern of operation followed that of the rest of the coal mining industry—a period of reduced operation due to softening of the market in the late spring and early summer but strengthening in the late summer.

An analysis of production data through 1950 (the last year for which figures are available) reflects the shift of strip tonnage from operations on a war time basis to operations where the stripping of coal has become a part of normal production. In the fields showing substantial increases in production the depth of overburden is rather uniform over large areas. While there is a decreasing amount of coal acreage underlying a shallow overburden, larger equipment makes it economical to mine to greater depths and has the effect of increasing strippable coal reserves. Acreage under from 70 to 100 ft of overburden is quite often found in flat or rolling country.

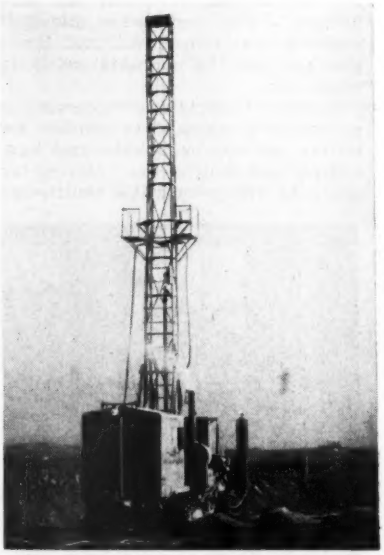
The year was characterized by the crystallization of the sound long range planning of recent years, in the completion of super preparation facilities, highwall mining and the perfection of equipment for overburden preparation and removal.

New Drills In Use

In a review of the many phases of open pit mining, the progress in drill design and method seems to have been greatest, with the relative perfection of the rotary drill with tricone bits and compressed air for the removal of cuttings. Percussion drills are still used, generally for very hard material especially when it is located immediately above the coal seam. Until recently, with the concentration of attention on excavators of higher capacity, progress of drill design lagged far behind engineering of modern draglines and shovels. Introduction of the new principle of compressed air, with rotary drills may approximate the difference and bring drills the status of other overburden equipment.

The churn drill of former days has given way largely to the percussion and rotary types, both of which use compressed air. As a substitute for water to remove cuttings, compressed air is now used with favorable results. Pressurized air and suction combined remove cuttings from the hole. The air, blown down the hole at a very high velocity, passes through a strainer before entering the orifices of the tricone bit. It serves to cool the bit; forces cuttings from between the bit and the wall of the hole and blows rock chips out of the path of the bit so they do not have to be ground up, thereby materially lengthening the life of the bit and increasing drill efficiency.

In one operation at least, expensive vertical drilling with percussion drills has been replaced by selective horizontal drilling with the design of a



The big advance in drilling was the combination of speed of a rotary with versatility of a churn drill

frame on which two horizontal drills are mounted to drill at any height within the range of 35 ft above the coal seam. This affords the advantage of drilling in the softer shale between the hard strata.

Another innovation in drilling equipment is a rotary drill designed with a frame high enough to allow a 48-ft continuous stroke, combining the speed of a rotary drill with the versatility of a churn drill. In blasting, while no startling developments have appeared in the manufacture of explosives, the method of detonation has been definitely improved. Introduction of a cord fuse with a delay element built into it has made possible a marked reduction in blasting vibration, which promises to eliminate complaints against blastng from residents in nearby communities; a very welcome relief to the industry.

Predict Larger Equipment

Overburden removal, as always, the major stripping job, has been characterized by the improvement of existing equipment rather than the introduction of larger units. This does not in any way mean that the limit has been reached in the capacity of either excavating or haulage equipment, as no doubt the trend will be to even larger units as overburden depth continues to increase. Present shovels up to 50-cu yd and draglines to 35-cu yd capacities will no doubt be superseded by still larger ones. During the past year, though, possibly the greatest activity has been in the replacement of existing power units and front ends along with other refinements to increase the efficiency and range of equipment in service. There has been a steady improvement in finding the weak spots and replacing them with higher grade material. Also there have been many new plans of overburden removal using combinations of shovels and draglines in tandem and parallel. Parallel-tandem stripping provides separate full depth cuts for the shovel and dragline, thereby increasing shovel time in most strata.

The latest distinct type of excavator which has been in high production for the past few years, the wheel type, is commanding increasing interest, especially in the midwestern sections where overburden is suitable for this type of operation. This mammoth machine embodies many unusual features in both excavating and material handling. Conveyor speeds and capacities and range of spoil movement are outstanding.

Road and grade conditions from level and smooth surface highway to steep, soft and bumpy temporary haulageways in the pit, present a problem for the design of haulage units. In spite of these obstacles, the trend is still to larger equipment. Units up to 70-ton capacity, powered by 400-hp drives, are in use. The Hydraulic Torque Converter, which is being generally tried by the industry, provides automatic, infinite variation in the torque ratio over a desired speed range resulting in singular smoothness of operation when accelerating or starting heavy loads.

Recover Lost Coal

Probably the development which has caused the most interest among operators in contour stripping terrain, and this includes possibly 80 percent of the total stripping industry, is large auger mining in highwalls. Recovery of coal after stripping has reached its economical limit by the use of augers is generally accepted by the industry. Much coal has been recovered that would probably never have been mined previously, especially that located between the economical stripping limits and old underground workings.

Augers up to 60 in. in diameter have been in operation for the past three years in the Pittsburgh seam and have been tried in other fields with favorable results. Practical drilling depth at present seems to be about 210 ft

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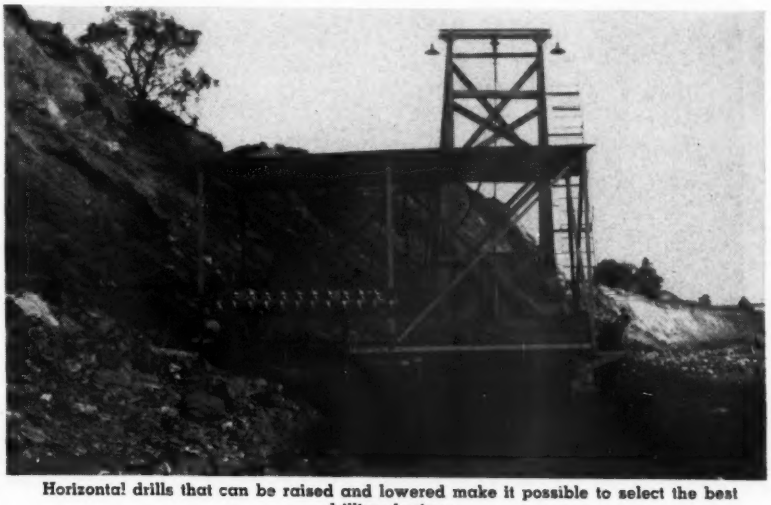


Horizontal drills that can be raised and lowered make it possible to select the best drilling horizon

Walking dragline with a 30 cu yd bucket on a 200-ft boom removes overburden

Inventories at mines increased during the year

Sulphur in the Spotlight

Year Marked by Increased Production Also Saw First Imports in Many Years

By W. W. DUECKER and E. W. EDDY
Texas Gulf Sulphur Co.

IN 1951, the American sulphur industry again operated at capacity. During the year an estimated 5,300,000 long tons of brimstone, a record total, were produced by the hot water or Frasch process, compared with 5,192,000 long tons in 1950. The increase in the total was due mainly to the exceptionally good production rate attained during July, August, and September. The year also saw an extraordinary increase in the quantity of sulphur recovered in gas cleaning operations. But, unfortunately, total production was unequal to demand and sulphur continued to be in short supply.

During the year domestic consumers were supplied under rationing procedures set up by producers. Foreign shipments were made in tonnages established by the International Materials Conference. After July 2, 1951, receipts of sulphur into Canada were under the control of the Canadian Department of Defense. On June 1, 1951, the National Production Authority issued its original sulphur order limiting domestic consumption of sulphur to 100 percent of the annual 1950 rate. The order was modified on November 9, limiting sulphur inventories at consumers' plants to a 25-day supply. As none of these measures seemed to give the desired result at the end of the year, in an attempt to achieve during 1952, a balance between estimated supply and demand, N.P.A. acted to restrict the consumption of sulphur and sulphuric acid. Under the new order which went into effect January 1, 1952, the consumption of sulphur by a consumer is restricted to 90 percent of his use during 1950. The order also makes it possible for N.P.A. to support defense, public interest, and hardship requirements through issuance of directives. It should be noted that N.P.A. in setting the 90 percent limitation, estimated the 1952 domestic Frasch process production of sulphur at 5,200,000 tons. This is about 200,000 tons more than estimates made by domestic producers.

Figures in the accompanying table show the extent to which both foreign and domestic shipments were restricted in 1951. Consumers drew heavily on their sulphur inventories in order to continue to produce at rates close to the 1950 level. This is indicated by ten months domestic production of new sulphuric acid which is only a half percent greater than the same period in 1950. Sulphur uses both domestic and foreign, would have been greater had the supply been available.

To Bring In New Mines

Fortunately, the sulphur industry is taking vigorous steps to correct the shortage. In 1952 increased sulphur production will be obtained from several new sources. The Texas Gulf Sulphur Co., at about the mid-year, expects to start operating a new mine at Spindletop, Texas, designed to produce about 300,000 long tons a year. The company is also increasing by 50 percent the capacity of its plant at Moss Bluff, Texas. Late in 1952 Freeport Sulphur Co. expects to complete a new mine at Bay Ste Elaine, La.,

THE PRODUCTION, SHIPMENT AND CONSUMPTION OF ELEMENTAL SULPHUR IN THE UNITED STATES
1000 long tons

Frasch Process	1949	1950	1951 (Est.)
Production	4,745	5,192	5,300
Producers Inventories at Mines at end of year	2,701	2,388	2,688
Shipments, domestic	3,358	4,064	3,725
Exports, Crude Sulphur			
Overseas	1,191	1,087	925
Canada	240	354	350
Total Shipments	4,789	5,505	5,000
Recovered Sulphur			
Shipments	42	79	210
Estimated Total Domestic Consumption	3,580	4,375	4,350

with an estimated annual production of 150,000 long tons. This mine was acquired as a result of an agreement with The Texas Company covering the acquisition of the sulphur rights on three prospective areas—Bay Ste Elaine, Dog Lake and Lake Pelto domes in Terrebonne Parish, La. The same company has announced a new 500,000 long ton per year plant at Garden Island Bay in the Mississippi Delta where The Texas Company is producing oil. Hopes are to have this mine in operation sometime in 1953. Somewhat dimming these four new projects is the fact that three of the smaller, currently producing mines are approaching exhaustion and can be expected to produce progressively smaller tonnages in the next few years. Four major sulphur producers, Texas Gulf Sulphur Co., Freeport Sulphur Co., Duval Sulphur and Potash Co., and Jefferson Lake Sulphur Co., are actively exploring the Gulf Coast for new sulphur domes. Mexico entered the sulphur picture in an important way in 1951 when its Petroleos Mexicanos (Pemex) brought in a plant recovering 130 long tons of sulpur per day from hydrogen sulphide gas at Posa Rica. And in Mexico, on the Isthmus of Tehuantepec, sulphur producers are making an intensive search for new deposits.

Recover By-Product Sulphur

Other sources of sulphur are being expanded. One of these is the sulphur in sour natural gas and in refinery gases. In 1948, the Southern Acid and Sulphur Co. (now Mathieson Chemical Co.) was the only producer of sulphur from sour natural gas in the United States and in the same year 44,369 long tons were recovered from all sources. For many years small quantities of sulphur were also recovered in connection with the cleaning of municipal and coke oven gases. The Texas Gulf Sulphur Co. soon thereafter (1949) erected a plant at Worland, Wyo., which extracted sulphur at the rate of about 100,000 long tons per year from gas available in that area. In 1950 the production of recovered sulphur from all sources jumped to 142,475 long tons and should total 210,000 tons in 1951. Present shortages of sulphur have focused attention on this source with the result that many chemical companies and petroleum refineries are reappraising by-products formerly wasted. If all plants now building or in the planning stage materialize it may well be that an annual rate of recovery by the end of 1952 will be as high as 400,000 long tons and by the end of 1953 around 700,000 long tons, all sulphur which was formerly wasted.

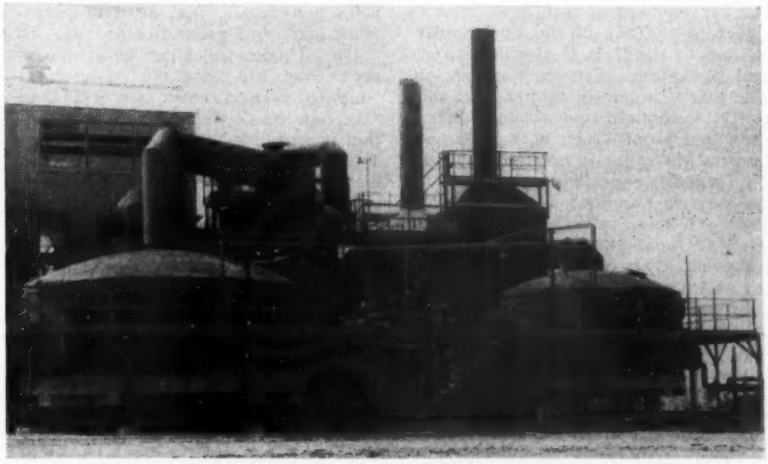
Producers' inventories at the mines as shown in the accompanying table increased during the year to an estimated 2,688,000 long tons. These inventory figures are calculated by subtracting shipments from total production. A part of the inventory consists of the vat bottoms or foundations of the vats which are not available for shipment, not at least until the mine is completely exhausted. A working inventory has to be maintained while sulphur is cooling and also to provide loading faces of sufficient size to handle the daily shipments. The inventory at the mine which might be calculated to be six months supply, based on shipments, is really considerably reduced when consideration is given to vat bottoms and operating requirements.

Foreign Output Inadequate

Less encouraging are the prospects of the foreign sulphur producers. Italy and Japan are the important producers of sulphur ores with Chile, Argentina, France, Turkey and several other South and Central American countries supplying small tonnages. Production of Italian sul-

(*Continued on page* 85)

1951 was a record year for brimstone production by the Frasch method



By-product sulphur plants may have 400,000-ton output by end of 1952

The theory of ore deposition is to practical search for ore in the field as experimental bacteriology is to preventive medicine

Geology In Exploration

Development of Teamwork, New Techniques and Important Discoveries Notable Features of Year

By CHAS. H. BEHRE, JR.
Professor of Geology, Columbia University,
and
Consulting Geologist, Behre, Dolbear and Co.

THE outstanding feature of exploration geology during the past year and the period just preceding has been the development of teamwork in some quarters, notably in the joint undertakings of the U. S. Geological Survey and the Atomic Energy Commission. The lesson is surely taking hold that collective thought and action is better than individual effort, no matter how unusual the capacity of the individual. This mood is especially pointed up by the new techniques. Procedures desirable in field exploration are so complicated today that no scientist or technologist is competent to carry on the entire campaign by himself. New chemical and physical approaches are called upon, as well as the most exacting but perhaps less exact methods of the older and more widely understood sciences of structural geology, petrology, and mineralogy. Future exploration, especially in territory hitherto unopened, will by no means be confined to traditional geologic mapping, though this will remain the core of search for ore deposits and for the solid non-metals, just as with petroleum, gas, and groundwater.

On all sides the observer sees concern over the shortage of mineral supplies. Tacit bows are made to "the new look" that mineral exploration is wearing but mining companies are slow to interest themselves in methods unless the project promises sure results. Since few reputable persons are willing to give absolute guarantees, exploration proceeds, for the most part, only in the good old ways. Moreover, despite the need of the times, it seems to be declining. A questionnaire by the Mining and Metallurgical Society showed that in 1949 exploration activity was 67 percent less than in 1940 among the leading American mining companies questioned, and these figures make no allowance for increasing costs in that interval. The conspicuous and cheering exception to such generalizations is the petroleum industry, whose consequent success has been so striking that petroleum corporations have found it advantageous to diversify their capital investment by entering the mining field as well. Perhaps their breadth of vision may be communicated to the rest of the industry by catalysis.

Geophysics Use Increased

The exploration for the solid minerals—those other than petroleum, natural gas, and water—geophysical methods are finding a greater range of application but not a greatly increased use. The stimulating symposium conducted in Denver in 1948, jointly by the Society of Exploration Geophysicists and the American Association of Petroleum Geologists, was an earnest effort to determine why the application of geophysical methods has found so little favor in the search for ores. A reason recognized there as undoubtedly contributory toward this conservatism is that the unit to be sought in most exploration for ores and industrial minerals is so much smaller than in drilling for petroleum. Instead of a broader, more regional search for larger tectonic and sedimentary features, exploration for a vein, for example, calls for pin-point-

ing that usually ends with diamond drilling toward a very small target. But another reason, though less tangible, is no less real; the application of geophysics to exploration on so fine a scale necessitates a perfection of instrumentation and the development of the proper interpretation through theory. Both of these basic requirements make imperative careful objective research, free from any efforts to justify one instrument or method as against another. An illustration of the reality of this problem is afforded by recent studies of sensitivities and instrumentation of Gamma ray detectors. To put it differently, the work of the practical geophysicist must be preceded by that of the scientific theoretician and experimentalist. Who is to support such studies? The consultant, who is paid for applying, not for developing, the new methods?

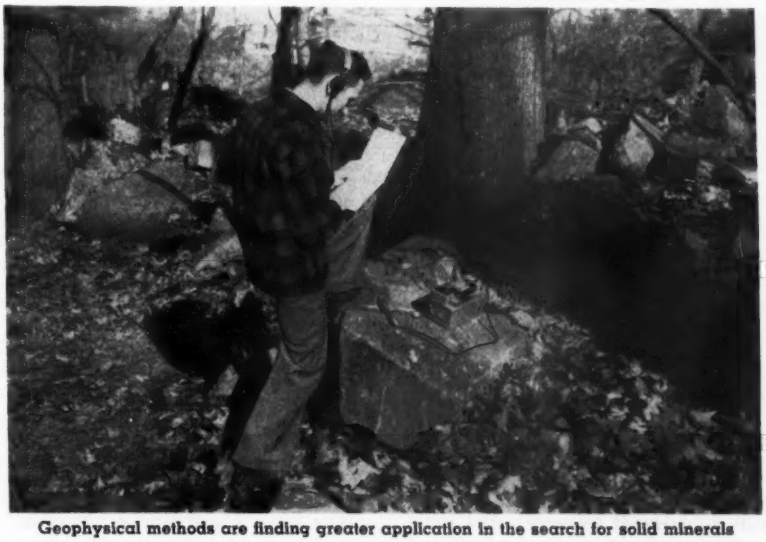
Research Costs Deductible

Basic research in geophysics is a problem for the mining industry as a whole. Cost of such basic research to an individual or to a company is likely to be heavy; few, even of the larger mining corporations, are willing to undertake it. Perhaps a half dozen in the United States have felt able to assume the burden: the Newmont Corp. and the New Jersey Zinc Co. are among the few carrying on such studies, as distinct from the application of old methods devised by others and applied to problems of direct exploration. A more generally available procedure would be cooperative research by several companies. In either case, the cost of such theoretical studies can legitimately be charged, we are reliably informed, against corporation income and is tax-deductible.

On the Canadian side of "the line," mining companies appear to be more interested in developing basic ideas in geophysical exploration. An interesting case, the fruits of which are tangible, is the attention devoted by Stanley Davidson to the use of electromagnetic systems in exploring for nickeliferous pyrrhotites. Elements of the method devised by Dr. Davidson were subsequently modified and applied successfully by R. W. Drybrough to the finding of the new Lynn Lake (Manitoba) nickeliferous and cupriferous pyrrhotite body now being developed by Sherritt Gordon Mines—another of the nickel lodes of the Canadian Shield. An equally good case of putting theoretical analysis of magnetic anomalies to practical use is the recent discovery of an ore horizon at the Stilfontein Gold Mine in the Transvaal.

On the more practical side of geophysical exploration, perhaps the greatest progress made in very recent years is: (1) the use of the flying magnetometer; and (2) the increased perfection of instrumentation to detect radiations from radioactive minerals. As to the former, large parts of Canada are being systematically flown by the Geological Survey of Canada, and the U. S. Geological Survey has published maps of traverses in parts of the Lake Superior states in which extension of known iron reserves may be expected, as well as other parts of the United States of possible value in mineral resources. The Government magnetometric work in the Lake Superior region has led to important increases in reserves. Another iron ore find of great value, achieved in much the same way, is that of the Bethlehem Steel Co. at Morgantown, Pa. On the other hand, the exploration for Cerro Bolivar in Venezuela—one of the two large iron deposits recently discovered in this part of South America—is reported by the discoverers to have been made by ground traverses.

In the field of radiation detection by Geiger counter, scintillometer, and similar instruments, the effort has been especially toward greater portability, under the stimulation of the U. S. Geological Survey and especially of the U. S. Atomic Energy Commission.



Geophysical methods are finding greater application in the search for solid minerals

Geochemical Research Needed

Scientific progress is also badly needed in the field of geochemical research. The most important and fundamental phase of this work has to do with mineral genesis, though this is naturally not the aspect that bulks largest in the eyes of the exploration geologist, under pressure to find ore by the shortest route. A commendable growth of interest in the chemistry of ore transport and the mechanics of its deposition has led to a rebirth of experimental work in several laboratories, of which those of the University of Toronto, Northwestern University, and the Anaconda Copper Co. are outstanding. More recently, Leland Stanford University and the Geophysical Laboratory of Washington have likewise devoted attention to experimental attack upon ore transport and published useful contributions. The connection between the theory of ore deposition and the practical search for ore deposits in the field is like that between experimental bacteriology and preventive medicine. The same theories of ore deposition appear cyclically, in part because of the paucity of quantitative geochemical data which can be drawn upon by geologists concerned with ore occurrence and distribution as a check on purely speculative ideas. Here again is a field where more research and more support are badly needed in the best interests of the mining industry.

When the mining geologist refers to geochemistry, however, he generally has in mind not such basic studies but rather the more immediate application of geochemical techniques to field exploration. The approaches are following several lines. Rock or "vein" decay concentrates the less soluble metals in the outcrop where they can be detected by semi-quantitative "wet" analyses or with some modification of the spectroscope. Plants growing above mineralized rock take in from the soil certain metals found in more than average quantity in the underlying deposit. Stream waters flowing over a mineral deposit may dissolve some metal from the outcrop and thus, by contrast with neighboring streams, show a higher than average concentration of the metal, and so afford a clue to the location of the ore deposit. Residual soil above an ore body, now hidden by rock decay or

vegetation, may contain traces of the desired element. These facts make it possible to narrow down the search for ore in a larger terrane known to be mineralized, much the way the old-time prospector decided where to look for gold veins by tracing "pay sands" in stream gravels. Each of these lines of attack also has its difficulties, such as the physiologic preference shown by some plant varieties for certain metals and their tendency to reject other metal ions. Good illustrations of these methods are furnished by the work at Johnson, Ariz. and at Tintic, Utah.

It comes as a shock to many persons who have not had occasion to follow these new lines of prospecting to learn that our strongest competitor in mineral production, the U. S. S. R., has made very striking progress in the techniques of geochemical prospecting. Several American publications have appeared in recent years whose object has been to put before exploration geologists and geochemists who do not read Russian, the methods developed by U. S. S. R. scientists in this field.

Standard Methods Improve

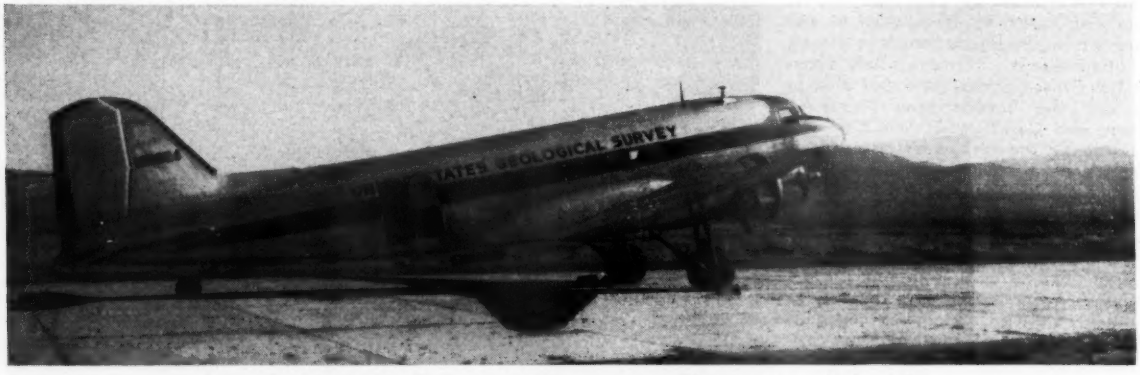
Standard exploration work by the mining geologist has come to be quite well appreciated by progressve mine executives when mine development and operation are the problems in hand. It is widely known that geologic mapping underground can greatly decrease operating expenses and make itself generally useful to the management. Geology is likewise being increasingly applied to extension of ore bodies where structural patterns, once established as preponderant in a given locality, can be used as guides for the projection of ore bodies; illustrations are the work of Oosterbosch on copper mineralization in Katanga, of Sorenson in the Coeur d'Alene "silver belt," and of the several cooperating government agencies (Federal and State) and mining companies in the Upper Mississippi Valley zinc district.

Specal attention is now being devoted by exploration geologsts to methods developed in recent years based upon country rock alteration. This approach depends upon the observed fact that, especially in places where the country rock is igneous, certain minerals related to the "kaolin" and "hydromica" groups are developed near ore deposits, apparently as one product from ore-depositing solutions. The technique involves: (1) the recognition of the minerals by use of the petrographic microscope, X-ray technique, and differential thermal analysis; and (2) tracing the "halos" of such alteration areas in the field in an attempt to relate them to the location of the ore bodies themselves. Leaders in this kind of work—such as T. S. Lovering, P. F. Kerr, and G. M. Schwartz—are in the universities and U. S. Geological Survey. A special type of alteration of the same general origin is the development of carbonates (especially dolomite and siderite) near ore bodies in sedimentary and metamorphic rocks. At bottom such work is closely related, in a degree not yet realized, to the permeability of rocks, especially of the favorable beds. At first blush it would appear that such alteration patterns are too widespread to be of use in "pin-pointing" exploration. It must be recognized, however, that the method is at a preliminary stage in its development. Large-scale study now being carried on at Tintic under the U. S. Geological Survey will doubtless clarify its limits and sharpen its usefulness. Though they are not yet applicable with confidence, at least one case has been reported where these methods led to ore and in one form or another they will certainly become a standard procedure in future exploration techniques.

On quite another front, less "practical" than the preceding, important studies relating to the intimate textures of ore minerals have been under way. The almost simultaneous appearance of E. S. Bastin's excellent "Interpretation of Ore Textures" and G. M. Schwartz's briefer discussion of the same subject represent marked forward steps in systematizing the microscopic study of ore minerals.

Color Photography A New Tool

The greatest problems that face the practicing economic geologist turn on how to relate the detailed data accumulated in one of several local field or laboratory studies on the origin and localization of minerals to the practical search for ore in another locality. These problems arise especially in new areas, where the types of mineralization are relatively unknown, the general geology is still poorly understood, and too few mines have been opened to furnish a clue to the structures that control local mineralization. Here the line of attack is based on the general geology of the region, however sketchily outlined—though the better the geology is known, of course, the more confident is the prognosis—and on some broad philosophy of search. In most of western Europe and in the United States, as also in much of southerly Canada, the bedrock geology is fairly well known except where glacial cover conceals it.



Team of airplane and color camera merits greater consideration for geologic studies

In these regions areas of hope and of discouragement can be fairly definitely outlined. In most of northerly Canada and in much of Latin America (Mexico, Ecuador, and Bolivia, and especially Brazil and Chile), as well as in most of Africa and Asia, the geology is still not well enough known to narrow down in a preliminary fashion the most promising areas which merit a more careful examination. Such world regions defy the detailed approaches of most geochemical and geophysical exploration and are too large for detailed mapping as a first approach.

In these areas a major team of instruments, scarcely as yet even considered on the scale it merits, is the combination of camera and airplane, especially with color photography and particularly where vegetation and soil cover are sparse or moderate. Admittedly more expensive per exposure than black-and-white photographs,

(*Continued on page* 80)

Wire bars to be drawn into millions of miles of copper conductor are vital to our complex civilization

Copper Shortage Will Be Relieved— But Not Immediately

By TOM LYON

Director, Program Development Division, Defense Minerals Procurement Agency

CIVILIAN consumption of copper during the year was greater than any year in history. The per capita consumption in 1935-39 averaged 14.3 lb. In 1950 it climbed to 25.3 lb, which was within two or three lb of the per capita consumption of copper in 1940-44. The latter, of course, included military consumption. During 1950 the mines in the United States produced 909,000 tons of recoverable copper; 651,000 tons were imported and 474,000 tons were produced from old scrap, the total being 2,034,000 tons. Of this 138,000 tons were exported and 1,921,000 tons were consumed. Stocks of refined copper in producers hands fell from 61,000 to 26,000 tons, leaving the smallest balance since 1906. Fabricators' inventories dropped 65,000 tons during the year leaving a balance that was the smallest for many years. Domestic production of copper during 1951, is estimated at 950,000 tons. Third quarter strikes caused a loss of 25,000 tons output. Imports during the first half of the year were at an annual rate of only 500,000 tons, an indicated loss of nearly one-fourth of the 1950 imports. The production of copper from old scrap will probably not exceed 430,000 tons, compared with 474,000 tons for 1950.

During the period immediately following World War II, when Europe was broke, the United States took over many of Europe's foreign supplies. Prior to World War II Europe consumed more copper than the United States. Now that Europe is getting back on her feet, a tremendous pent up demand for metals is being realized; consequently the United States can no longer figure on getting the bulk of the now known foreign production. Before imports will satisfy demands, additional mines and facilities will have to be brought into the picture. In addition to Europe's normal demand for copper, the expansion in defense activities abroad will naturally require more supplies of this metal.

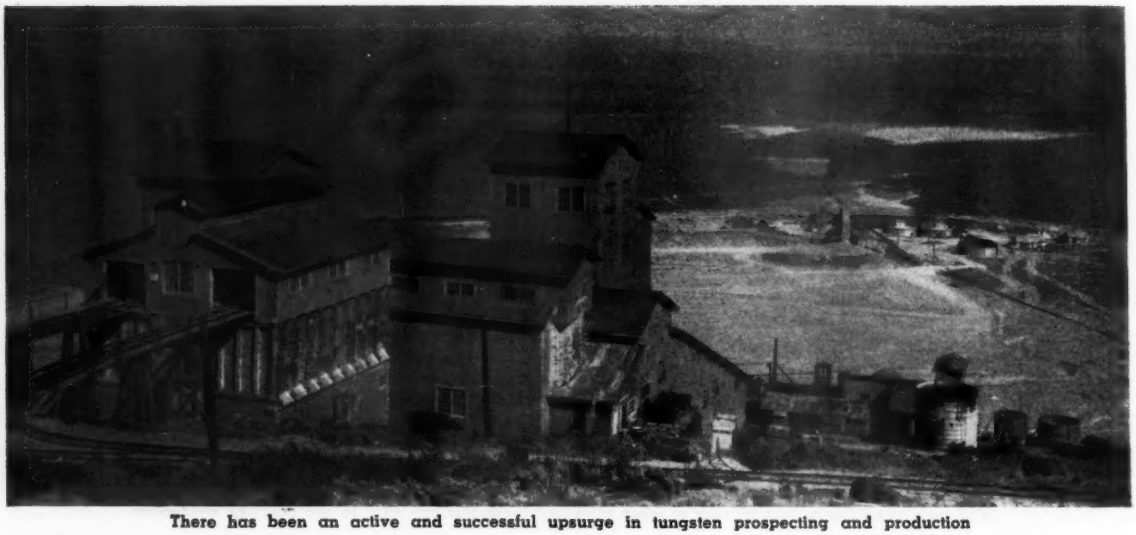
During 1951 the United States can expect a total supply of approximately 1,870,000 tons of which 140,000 tons will probably be exported, leaving 1,730,000 tons for domestic consumption, which is nearly 200,000 tons less than was available in 1950.

The domestic copper industry is expected to expand to a point where an additional 225,000 tons will be produced by 1955. This will relieve the situation to some extent but not immediately. World production rates have not equalled capacity rates despite the great demand and high prices. This lag is due to labor disturbances in several large producing countries, transportation, lack of power at some locations, and to other factors.

The United States was placed at a competitive disadvantage by the general price freeze which prevented domestic copper prices from rising while those abroad had already advanced. For a limited tonnage, fantastically high prices were paid. Primary producers in the United States were at a disadvantage compared with other purchasers of scrap because it was necessary to gear their purchases to the ceiling for electrolytic copper whereas other users purchased scrap in the freeze period at prices in excess of those for new metal. Confusion resulted also from the uncertainty over what action would be taken in regard to the copper tariff, subsequently suspended April 1, 1951. The agreement between the United States and the Chilean Government raising the price for Chilean copper sold in the United States to three cents above the ceiling price resulted in a two-price system, and caused confusion in the industry.

Expansion will cost the industry about $500,000,000 of their own funds. in the next five years in expanding the mining industry to produce an additional 250,000 tons. This will relieve the situation to same extent, but not immediately.

A review of the situation reveals that no matter how much requirements may be increased or decreased—there is a shortage of the three basic metals, copper, lead and zinc, that is not going to be overcome right away. As far as copper is concerned, during the next two years things will be bad. After that some of the producers will begin to come in. Yerington will probably be producing within the next two years, possibly some of the others. There are five big projects on hand including Yerington: the Copper Range Co. in Michigan; the Phelps Dodge, East Ore Body; A. S. & R., Silver Bell; and San Manuel.



There has been an active and successful upsurge in tungsten prospecting and production

Tungsten, Mercury and Chrome

Dramatic Increase in Tungsten Mining Is Encouraging but Outlook for Mercury and Chrome Mining Is Dim

By IRA B. JORALEMON
Consulting Engineer
San Francisco

During World War II domestic production of mercury hit a rate, in late 1943, of over 60,000 flasks a year. All available figures indicate that in 1951 there were 6400 flasks of mercury produced in the United States. Consumption during 1951 was 60,000 flasks and is expected to remain the same during 1952, while estimates indicate that domestic production will be 15,000 flasks. Under present conditions no further appreciable expansion can be expected.

Basic reason for the discouraging production outlook for mercury and chrome is the fact that domestic mines cannot, in normal times, compete with foreign sources or foreign cartels. The present emergency has caused a temporary shortage of both metals, and the domestic prices are materially higher than two or three years ago. Mercury price, however, is only slightly higher than during World War II and chrome ore sells for slightly less than in 1942-1943. Present return to the miners is far too low to make up for the decreased purchasing power in wages and materials of the unit that is still deceptively called the dollar. Eighty percent of our requirements of mercury and essentially all of our chrome is imported. Almost nothing has been done to increase domestic production. The chance of success is too slim to encourage private investors to try to find new chrome or mercury mines, or to bring idle mines to production.

In the case of mercury, several of the mines that were notable producers during the war have a limited quantity of ore developed, or can develop such ore quickly. As the reduction furnaces are already installed the cost of resuming production is comparatively small. Therefore, there will soon be four or five moderately sized domestic quicksilver producers compared to one, the Mt. Jackson Mine of Sonoma Quicksilver Co. in California, that was struggling for breath before Korea. Bonanza in Oregon, Cordero Mining Co. in Nevada, the old New Idria Mine in California are in production and the Reed Mine of Bradley Mining Co. in California may start in the late spring or early summer. Total domestic production, however, will not be as high as it was in the late thirties. A handful of smaller producers may be added to the list, but the present price is not encouraging the search for new orebodies.

Chrome Situation Poor

Chrome is in even a worse state. The Grants Pass purchase station has been reopened, and many lots of ore are being delivered to it. The limit of 2000 tons per year that will be accepted from any shipper takes away any incentive to develop important chrome deposits. A total limitation on the program of only a few percent of our annual requirements makes the program of little importance. Investigation of recovery of chrome and other minerals from Oregon beach sands met with some encouragement, but no large plant is in sight. New operators have applied for government financing or guarantees to permit re-equipment of the chrome properties in Montana that were being prepared for large scale production by Anaconda Copper Mining Co. as agents during the war. As yet there is no assurance that the domestic chrome industry will give more than a feeble gasp before expiring again.

By contrast the accomplishments in adding to domestic production of vitally needed tungsten are spectacular. Government agencies have helped with an ostensible guarantee of a price-floor of $63 per unit of tungstic oxide for five years, but specifications required to take advantage of the price-floor are so rigid that only a handful of mines are protected by this floor. Most of the mines must have their concentrates purified by expensive chemical treatment before they can be marketed, either to industry or to government agencies. With only two such treatment plants in the country, one adapted to higher and the other to lower grade concentrates, the charges for purification are so high that the miner receives little more than half the price the consumer pays for the tungstic oxide contained in

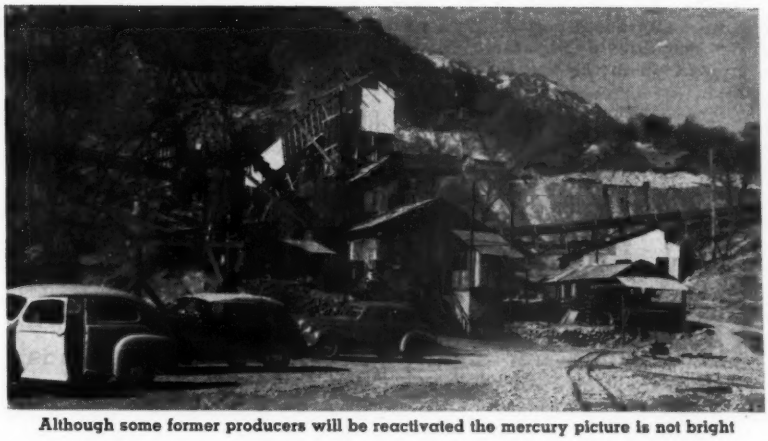
flotation concentrates. A well located, government owned or guaranteed third treatment plant like the one built in Salt Lake City by Metals Reserve Co. during the past war is urgently needed.

Tungsten Production Up

In spite of the uncertainty as to the effective price, there has been an active and successful upsurge in tungsten prospecting and production in the past year. Of the larger mines that were working from 1941 to 1944, United States Vanadium Co. at Pine Creek, Calif., is adding to the capacity of its "digester" plant for making artificial scheelite, and is milling a large amount of custom ore while its own ore output is limited pending completion of an underground shaft. Nevada Massachusetts Co. and Getchell Mine, Inc., in Nevada, are opening up new ore and promise to equal their large production during the war. The Nevada Scheelite Co. near Rawhide, under new ownership, and the Ima Mine of Bradley Mining Co. in Idaho have carried on development that will extend their life and production. Surcease Mining Co. now operates the old Atolia mines under lease, and by ingenious new treatment methods is maintaining a good production from material, both in hard rock and in placers, that was formerly thought to be worthless. Wah Chang Corp. has taken over both the Lincoln Mine at Tempiute, Nev., and the Black Rock Mine north of Bishop, and has added greatly to ore reserves at both mines by diamond drilling. The mill of the Northumberland Mine near Tonopah is being moved to Tempiute and adapted to concentration of tungsten ore. Even the Yellow Pine property of Bradley Mining Co., where the high grade scheelite orebody that saved the tungsten situation during World War II was exhausted in 1945, is again in the ranks of leading producers due to scheelite recovery from low grade antimony ore and from glacial detritus.

N. C. Mine Second in Output

Several new tungsten mines have become important. The largest is the Haile Mine of Tungsten Mining Corp., near Henderson, N. C., where hubnerite orebodies were found and brought to production too late to help greatly during the war. Now Tungsten Mining Corp. is second in production rate only to United States Vanadium, and construction that is approaching completion will nearly double the output. A long life is assured. A second important new producer is Climax Molybdenum Co., where recovery by byproduct tungsten minerals has placed this company well within the first ten in the list of domestic tungsten mines. An entirely new mine that was recently found and brought to production by Gabbs Exploration Co., near Gabbs, Nev., is also among the ten leaders.



Although some former producers will be reactivated the mercury picture is not bright

In addition to the larger tungsten mines, many smaller ones, both old and new, are adding to the production rate. An active exploration campaign, particularly in Nevada, is yielding satisfactory results.

Still more important are several scheelite deposits that are under development in the western states, but that have not yet come to production. At least three of these mines contain many hundred thousands or possibly millions of tons of ore, though the grade is not yet proven. Most important are the Browns Lake deposits, near Dillon, Mont. Many smaller discoveries may develop into important ones. These new mines are all so located that a new concentrate treatment plant in northern Nevada or Utah is vital to their success.

Except for the price-floor, of dubious value to most mines, and for a few exploration loans, the increase in domestic tungsten production and the promise of still greater future output have been brought about by private industry. The large investment has been made in spite of the fact that a resumption of trade with the oriental countries now under Communist control would force most of the domestic companies to shut down. Government agencies must give further assistance or price guarantees to

With amount of chrome ore accepted from any one shipper limited, there is no incentive to develop important deposits

justify the equipment of the new, large low grade deposits. With such aid domestic production can be brought up to the level of 1943 and 1944.

Domestic tungsten discoveries have been overshadowed by the great and rich scheelite deposits that have been developed by a subsidiary of Placer Development Co. near the old Emerald Mine in British Columbia, a short distance north of the border. Reserves indicated by diamond drilling are said to total more than 1,500,000 tons of ore that averages about 1.25 percent tungstic oxide. This promises to be the greatest tungsten district yet found in the western hemisphere.

Antimony

Domestic Production Up 20 Percent, Output Increase to Continue but Supply-Demand Balance Depends on Unforeseeable Factors

By JAMES P. BRADLEY,
Vice-President
Bradley Mining Co.

BASED on as yet incomplete statistical information for 1951, it is estimated that antimony supply and demand were about in balance during the year, and that the total U. S. supply of primary antimony (imports plus domestic mine production) amounted to approximately 18,000 tons (contained antimony basis) during 1951.

Domestic mine production in 1951 is estimated at about 3000 tons of antimony, compared to 2500 tons in 1950, or roughly 17 percent of demand. The Yellow Pine Mine and Smelter at Stibnite, Idaho, continued as the chief domestic producer and it is anticipated that the output of this property, practically all in the form of antimony oxide, will be increased during 1952.

Imports of primary antimony in all forms are estimated at approximately 15,000 tons for 1951, as compared to 15,837 tons in 1950. The main sources of imports, in order of importance during the first ten months of 1951, were: Mexico, Bolivia, Union of South Africa, Canada, United Kingdom, Chile, Belgium-Luxemburg, Peru, France and Yugoslavia. As usual, about 75 percent of the imports was in the form of duty-free ore and concentrate. Following the long-awaited settlement of the antimony price ceiling in November, 1951, increased shipments of antimony metal were received from Yugoslavia. Receipts of antimony oxide from the United Kingdom increased during the last quarter of 1951.

The consumption of primary antimony in metallic products fell off sharply in 1951 as compared to 1950 and previous years. However, the 1951 consumption of primary antimony in nonmetallic products increased by about 60 percent over 1950. This increase in nonmetallic consumption was due to the expanding military requirements for antimony oxide in the flame-proofing of textiles and plastics and in fire-retardant paints.

Whether or not the antimony supply-demand situation will remain in balance in 1952 depends upon such unforeseeable factors as the amount of military requirements and the availability of foreign supplies. Due to price ceilings and 60-day inventory limitations in this country, European buyers are in a good position to outbid U. S. consumers for world supplies in the event that a shortage again appears imminent.

There are many deposits of antimony ore in the western states, but the threat of foreign supplies flooding the market with practically no tariff protection continues to act as a deterrent to any important expansion of domestic mine output.

Zinc and Lead

(*Continued from page* 61)

able quantities of copper, silver, gold and cadmium and possibly recoverable values in indium, gallium and germanium. The trend in electrolytic zinc has been toward larger plant size and equipment units, mechanization of operations, higher by-product and residue recoveries and improvements in roasting.

Nearly 15 percent of the zinc of domestic origin in 1950 came from lead furnace slag treatment plants. Production from this source is being expanded substantially.

Requirements for Security

National security requires a healthy mining industry with ample productive capacity and experienced working forces. The mining industry can overcome existing shortages of lead and zinc and provide adequate production for future needs if assured of constructive administration of the Revenue Act of 1951 and afforded at least the same consideration and advantages given by our Government to foreign properties.

Whenever lead and zinc can be produced profitably with some assurance of market stability it may be predicted confidently that supplies will be adequate for the foreseeable future.

Geology in Exploration

(*Continued from page* 76)

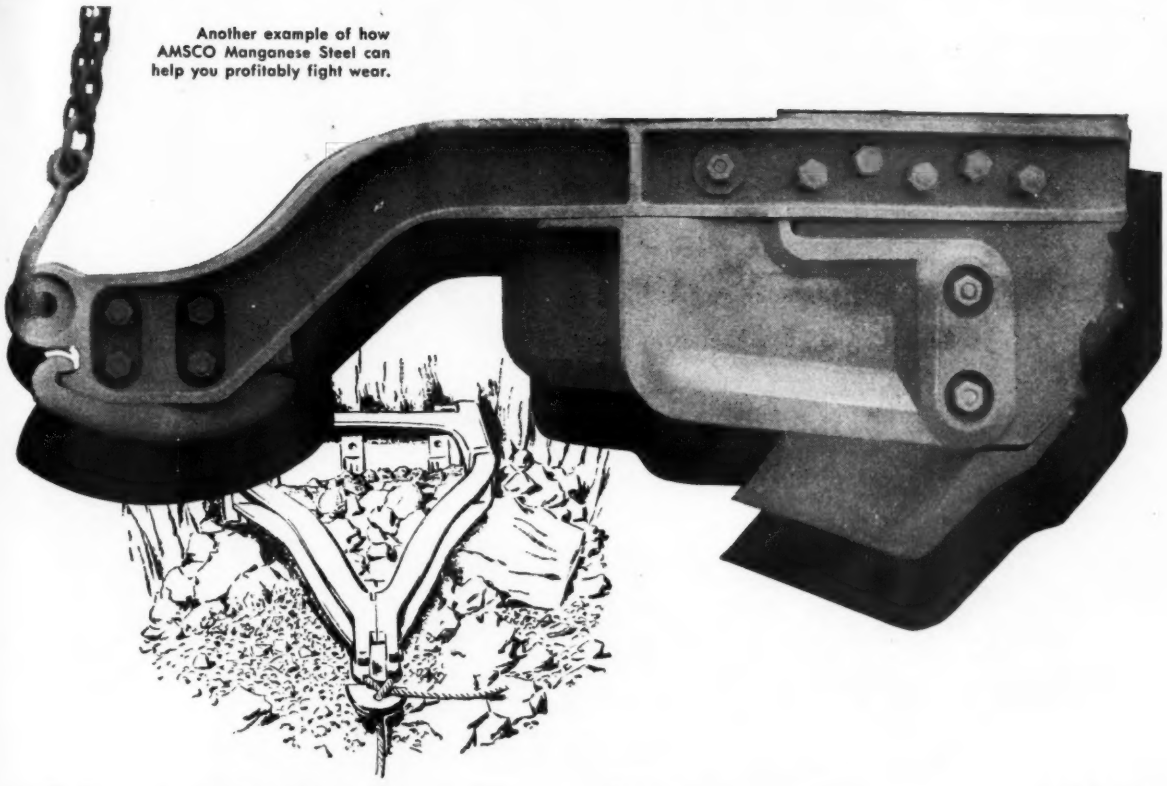
such photographs are economical in one sense—they do not necessitate overlap and stereoviews. Colors will serve to distinguish rock types with only a few field checks, and gossans and alteration halos should be easily recognized in color photographs if only the strips are flown at heights that are not too great.

New Discoveries Announced

Discoveries of new deposits in the United States of special importance and not mentioned elsewhere in this article include a new find of native sulphur at Garden Island Bay, La., near the mouth of the Mississippi, mentioned for the first time this year; two bodies of zinc ore—one in eastern Tennessee and one near Metaline Falls, Wash.; a gold strike in the Idaho-Maryland Mines, California; and an iron ore occurrence on the extension of the Cuyuna Range, Minnesota.

Mining Must Finance Research

The exploration geologist of the present and yet more of the future must look to many fields for help. He will be a coordinator of special geophysical, geochemical, photographic, and geologic techniques. His success will depend on the breadth of his outlook and the flexibility of his mind in adapting itself to new approaches. But the best of geologic personnel cannot do everything: the mining industry must be willing to contribute more of its running expenses to exploration and bear a larger share of the cost of the basic research on which exploration methods of the future will be founded.



Another example of how AMSCO Manganese Steel can help you profitably fight wear.

This SCRAPER cut maintenance costs 20%!

How AMSCO Manganese Steel proved tougher than a tough mining problem

One of the toughest mining operations you'll find anywhere—tough from the standpoint of how it punishes equipment—is scraping heavy, corrosive pyrite ore. For example, a California mine has a deposit of 98% pure pyrite—with a specific gravity of 4.8. Impacts and abrasion caused by this ore were making short work of the scrapers previously used . . . on the average they needed major repairs over 4 times per year.

Several years ago two scrapers of the type shown above, which are sold exclusively by Joy Manufacturing Co., were put in service. They were made entirely of AMSCO Manganese Steel, and since then they've mined *over 220,000 tons of pyrite ore — and they're still in excellent condition!* These scrapers are repaired only once a year; simple repairs involving relipping and hardfacing of wearing surfaces.

Obviously, not all mining or excavating operations are as equipment-punishing as this one . . . *but the moral is clear . . .*

WHEREVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .

. . . find out about longer-lasting, dollar-saving Manganese Steel made by AMSCO . . . world's largest producer of Manganese Steel castings for all industry.

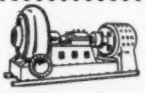
AMSCO controls impact and abrasive wear in 5 basic industrial operations:

Power Transmission

Mining and Excavating

Transportation

Crushing and Pulverizing



Materials Handling

Brake Shoe **AMERICAN MANGANESE STEEL DIVISION**

422 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

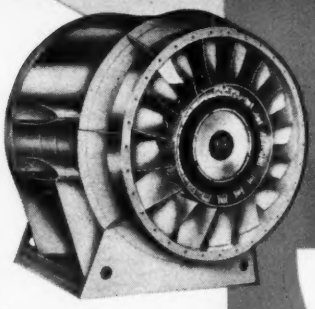
Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

JOY

AXIVANE* MINE FANS

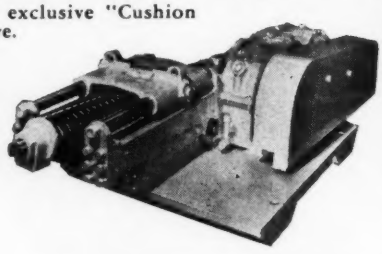
Vaneaxial-type fans for all main ventilation requirements—also Portable Blowers for auxiliary ventilation.

*Reg. U.S. Pat. Off.



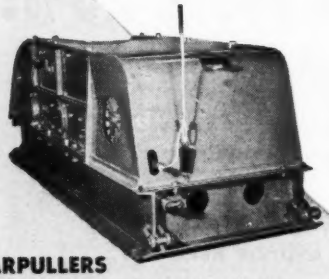
SHAKER CONVEYORS

Below, the exclusive "Cushion Stroke" drive.



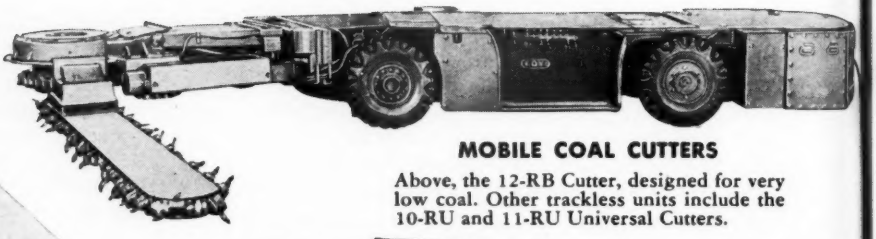
CONTINUOUS MINERS

Models for high and low coal.



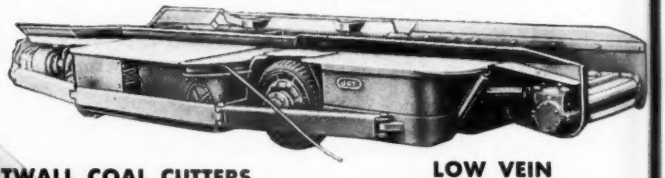
CARPULLERS

Other utility equipment includes a Caterpuller, Pulldozer, Timber Setter, Material Trucks, etc.



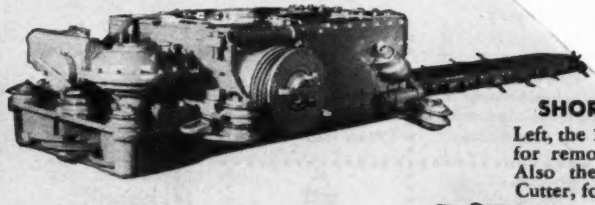
MOBILE COAL CUTTERS

Above, the 12-RB Cutter, designed for very low coal. Other trackless units include the 10-RU and 11-RU Universal Cutters.



LOW VEIN SHUTTLE CARS

Above, the 8-SC Shuttle Car, only 26" high for use in very low coal. The Joy line includes Shuttle Cars in heights, types and drives to meet any coal-mining conditions.

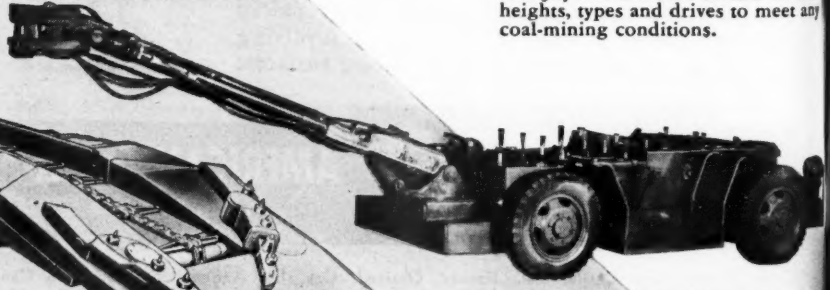


SHORTWALL COAL CUTTERS

Left, the 11-B Cutter, with Joy Bugduster for removal of cuttings from the kerf. Also the 7-B Heavy Duty, and 5-B1 Cutter, for small mines.

MECHANICAL LOADERS

Above, the 20-BU, a high-capacity Loader only 24" in height for very low coal. Other Joy Loaders to meet any need.

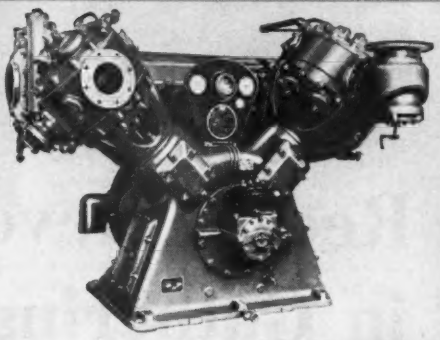


HYDRAULIC ROOF-BOLTING DRILL

Above, the RBD-1, fastest drilling machine built for roof bolting. Joy also builds a complete line of hydraulic Coal Drills, single and twin boom.

. . . Your Complete Source of Mechanized Mining Equipment

FIELD-PROVED to Give You Greatest Production Increases and Cost Reductions



AIR COMPRESSORS

Modern, package-type stationary units up to 3656 CFM. Above, the WN-112.

JOY Mechanized Mining Equipment is the result of years of pioneering research, development and on-the-job engineering. It is the world's most complete line of modern mining machinery, built by the world's largest manufacturer in the field.

These facts have real importance for you because they give you positive assurance of equipment that can stand the gaff, stay on the job and operate with the sustained high efficiency that means greater tonnage and lower costs. Whatever your requirements or seam conditions may be, in soft coal or hard, there's a field-proved JOY unit to do the job *best.* ● Let us work with you.

HIGH-CAPACITY SHUTTLE CARS

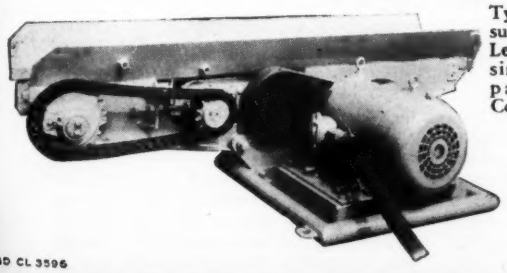
Above, the 10-SC—a rugged, heavy-duty Shuttle Car that can handle coal and rock in full seam mining.

PERMISSIBLE MINE-AIR COMPRESSORS

B. of M. approved. Self-propelled (the WK-83, right) or draw-bar models, up to 240 CFM.

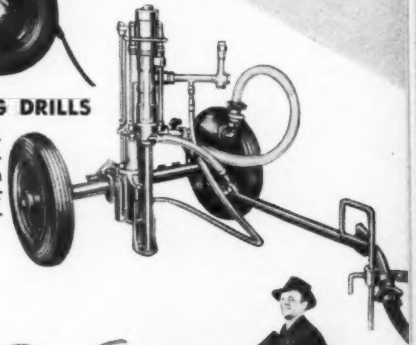
BELT and CHAIN CONVEYORS

Types and sizes to suit any conditions. Left, the new, light, simple and compact FA Chain Conveyor.



ROOF-BOLTING DRILLS

Right, the highly-mobile, fast-drilling SAW Wagon Stoper. Other drills for any roof-bolting need.



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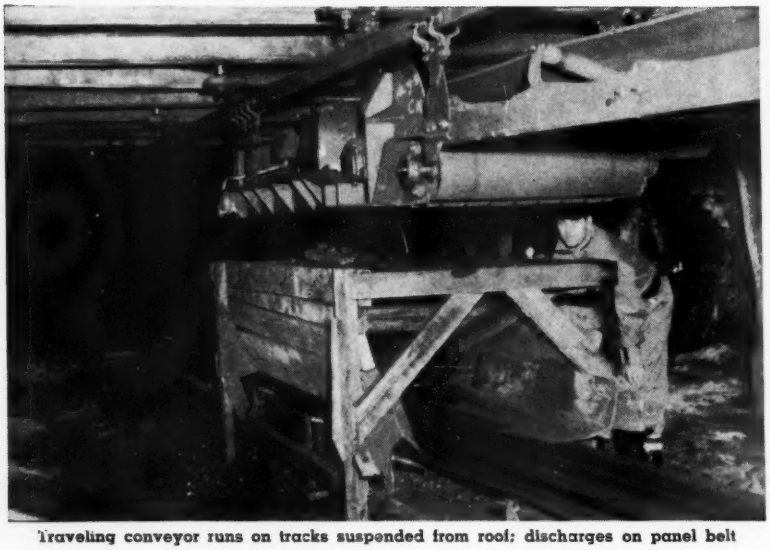


Traveling conveyor runs on tracks suspended from roof; discharges on panel belt

Recent Developments in Gathering Haulage

Latest Developments Mark a Milestone on Road to Greater Speed and Efficiency

By A. J. OPPERMAN
Consulting Engineer
Uniontown, Pa.

TWENTY-FIVE to 30 years ago the coal industry was worried to death with competition (as it still is today). State and Federal regulations, labor demands and the inroads of oil and gas were becoming increasingly greater. Something had to be done, and tradition was forced to take a back seat with the advent of more and more mechanical means for getting the coal from the face to the tipples. There will always be low production hand loading coal mines, but it is safe to say that in the long term ahead coal produced mechanically will increase steadily from year to year, while hand loaded coal, about 25 percent of our total production now, will steadily decrease.

Farseeing operators at that time knew that in order to survive they would, of necessity, have to find new and cheaper methods of mining the coal, and once mined they were faced with finding some form of beneficiation to provide the highly competitive markets with a uniform product. At one time the idea of replacing men with machines was fought vigorously, but miners had to revise their old ways of thinking and accept these improvements. Mining has come a long way since then, but while great strides have been made, all of the answers are not yet in. The very fact, however, that producers and manufacturers are now working closely together to meet the needs of the industry, is the best assurance that eventually the ills attending the mining of coal will be cured.

Higher Speeds Predominate

In any review of recent developments in coal mine haulage one thing stands out—the trend toward higher speed. It is difficult to improve main line haulage equipment. It has proven trustworthy, with proper maintenance, over a period of years. This is especially true of properly engineered installations where not only present conditions under which equipment was to perform, but also the long range program of future needs, was considered.

It is not uncommon today to see locomotive speeds of 15 mph, while a few years ago half that speed was considered good. Recent studies of large developing fields disclose a trend to contemplate speeds of 30 mph or more as safe. With improvements, brought forth in the last year or so, such as longer wheelbase, side equalization for easier riding and tracking, sturdier frames, built around ends for operator protection, air brakes, ventilating blower for traction motor, dynamic braking and many other features it seems safe to assume that little or no trouble need be expected from main haulage problems. At the same time the industry has reaped the reward of safer, more efficient and faster transportation.

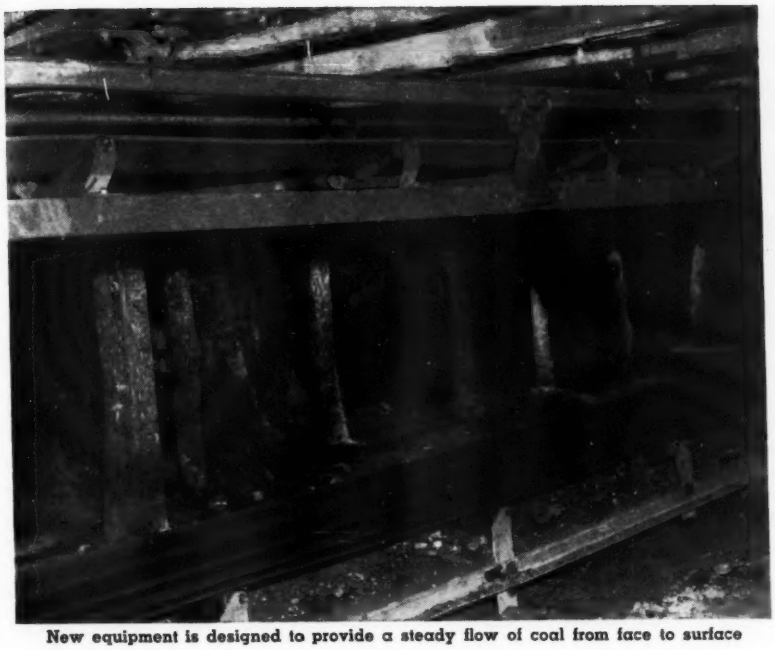
More tonnage per man employed is the goal every operator strives for and every faculty that man possesses has been put to work to increase this figure. Tonnage per man employed has been more than doubled in the last half century by the steady improvement of equipment and methods in all the phases of mining but the greatest increase should be credited to machines for loading coal. The operator then had the answer to face production but existing methods of service haulage couldn't get the coal away from the machine fast enough to make a material increase in tons per man.

Knowing that the face equipment could produce and that rail or belt haulage was amply flexible to transport great tonnages, industry still had the problem of service transportation to cope with, and the ingenuity of men was again taxed to the limit. The answer to this problem may not be too far off.

Present installations, with modern mine development plans have shown the shuttle car to be one of the best means for service haulage from the face to main discharge points. This type of transportation by itself, or in conjunction with other equipment easily available, when confined to short hauls, has been highly successful. Recent improvements indicate that these machines can be used in any mine where conditions permit.

New Equipment Introduced

Leading manufacturers of mining equipment have come forward in the last year with several types of equipment designed to provide a steady flow of coal from the face, whether it is from conventional loaders or continuous type machines. None of this equipment has been in service long enough to say it is the answer to the problem, and they may not all be flexible enough to use under any condition encountered, but they are a step forward. No doubt improvements will be added as severe service is encoun-



New equipment is designed to provide a steady flow of coal from face to surface

tered and the use of each is extended; as has been the case in the forward progress of any new idea.

One of these units employs the use of short chain conveyors emptying on other long conveyors and finally deliverying the coal to long room conveyors, mother belts, or rail haulage. A pivot action of up to 180° is provided on both ends of the unit to provide for easy maneuverability. The receiving end of this unit is attached to the loader and with dolly action moves with it.

Another unit is made up of short sections of belt conveyors, mounted on rubber tires and self-propelled. Attached to loading or continuous machines it operates in "snake fashion," and can be so installed as to have the outby, or discharge end, parallel belt or rail haul.

Now undergoing the acid test of service is an extendable type, composed of the standard intermediate belt conveyor sections, mounted on rubber tires. Pin-connected, for ease in assembly, it is moved toward advancing faces by a rope haul, while the discharge unit is stationary.

Available also is a shaker type steel belt conveyor, extendable to about 500 ft. Extension is accomplished by moving the tail section back and locking it in place. By mechanical means provided on the unit, the belt can be extended or retracted as needed and stored on the storage drum.

An installation, with the same purpose in mind, has been built for a northern West Virginia operator. This is termed a travelling conveyor and runs on tracks suspended from the roof. Roof bolts, timber sets, or steel bars can be used for this suspension. The unit advances as the coal is loaded at the face and travels directly above a long panel conveyor or mother belt, onto which the coal is discharged. These units, up to 400 ft long, can be used in each developing entry, or in conjunction with shuttle service. Excellent results have been obtained to date not only on delivery to belts, but for discharging into mine cars as well. In the latter case it is possible to place enough cars for an entire shift beneath the traveling conveyor, thus avoiding the time lost in shifting empties and loads. It can be applied broadly to all types of mining.

All this new equipment is ready to serve the needs of the industry wherever justified, and where constant benefits can be obtained. The year 1951 marked another milestone of progress in the coal industry, and an optimistic outlook is justified for 1952.

Sulphur

(*Continued from page* 73)

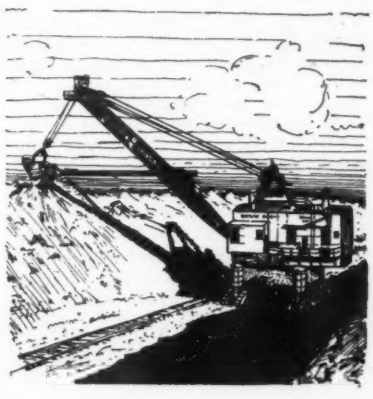
phur for the first ten months in 1951 is reported to be 162,848 metric tons as compared with 178,723 metric tons in the same period of 1950. In spite of the high prices available in export markets, high production costs and labor troubles have held back Italian production. Japan has recently increased its production and can supply its domestic needs but it has not reached prewar levels when it also made substantial exports. Nearly 150,000 long tons of sulphur are produced annually by the Orkla process in Norway, Spain and Portugal from sulphide ores, and while these plants are working at maximum levels, no increase in capacity has been announced.

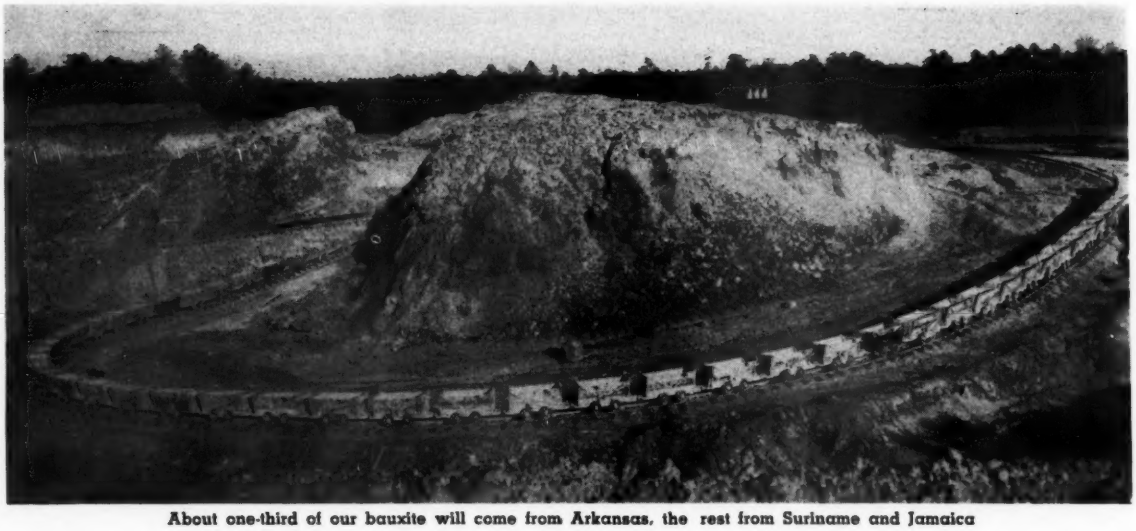
Sharp increases in pyrites production both in Spain and Portugal are reported by *Foreign Commerce Weekly* with Spain producing 800,790 metric tons in the first half of 1951 compared with 593,185 metric tons in the same period of 1950. Similar figures for Portugal show 355,893 metric tons for 1951 as compared with 299,710 metric tons in 1950.

In Europe the shortage of sulphur has halted the building of new sulphuric acid plants using sulphur and increased acid needs are now being met by plants burning pyrites. The United Kingdom has announced plans to convert a number of its sulphur-burning plants to pyrites and also increase its supply of acid produced from anhydrite (gypsum). Australia and the Union of South Africa, both large sulphur importers, have announced plans to increase their utilization of pyrites.

High World Prices Prevail

The domestic price of sulphur did not change during 1951 with the larger producers selling, respectively, at $21 and $22 per long ton f.o.b. mines. Prices in export markets for other than U. S. sulphur rose sharply and sales of Sicilian and Chilean sulphur remain at prices equivalent to $75 to $100 a long ton. The Department of Commerce statistics show that for the first time in many years, 1610 long tons of sulphur were imported by the United States during the first nine months of 1951 at prices ranging from $42 to $138 a long ton. Colombia exported to the United States 1085 long tons during this period at a declared value of $42 per long ton.





About one-third of our bauxite will come from Arkansas, the rest from Suriname and Jamaica

Aluminum and Magnesium

Greater Aluminum Production Foreshadows 90 Percent Capacity Increase While Magnesium Output Is Slated for 800 Percent Rise

By LAWRENCE LITCHFIELD, JR.
Vice-President
Aluminum Co. of America

PRIMARY aluminum production in 1951 was about 835,000 tons as compared to 716,627 tons in 1950. However, this bare comparison does not begin to describe adequately the profound changes in the aluminum industry which had their roots in events which occurred in 1950. During that year, even with domestic aluminum production at a peace-time peak and imports at an all-time high of 176,778 tons, civilian demand for aluminum, before Korea, exceeded the total supply of new metal. The demand was second only to that of 1943. The impact of the outbreak of the Korean action resulted in the situation of civilian supply becoming progressively less. It will continue to decrease until expansions undertaken by the aluminum industry in 1951 began to make their influence felt strongly. After that, barring an all-out war, the aluminum supply situation should get progressively better as new production units come into operation. Parenthetically, it may be said that experience during World War II taught the industry that estimates of requirements of light metals for military purposes are subject to sudden and drastic revision. Only a rash individual will hazard unqualified predictions as to the relationship between supply and demand at any given moment in the future.

Primary aluminum smelting capacity in 1950 was about 750,000 tons. The first increment of increased production was implemented very rapidly, and consisted of the reactivation of stand-by facilities, uneconomical under normal conditions, at the Massena, N. Y., and Badin, N. C., plants of Aluminum Co. of America. These went into operation in the fall of 1950 and their entire capacity, rated at 79,000 tons annually, was earmarked for the Government stockpile.

Expansion Plans Approved

Since the fall of 1950, and to date, the Government has approved expansion of the aluminum-producing industry in this country by 677,000 tons per year—an increase of 90 percent over the size of the pre-Korean industry. This expansion will be achieved through the building of new facilities and the expansion of existing facilities by the three establshed domestic producers, and by the proposed entrance of a newcomer into the aluminum-producing field.

Of the 677,000 tons, Aluminum Co. of America has undertaken to expand its capacity by 205,000 tons through the erection of new producing plants at Wenatchee, Wash., and Rockdale, Texas, and the extension of its Point Comfort, Texas, plant. Kaiser Aluminum & Chemical Co. is enlarging its capacity by 220,000 tons, which involves a new plant near New Orleans, La., and an addition to its present Spokane, Wash., plant. Reynolds Metals Co. is expanding by 180,000 tons by building a new plant at Corpus Christi, Texas, and enlarging plants already operating at Troutdale, Ore.; Longview, Wash.; and Jones Mills, Ark. A fourth company—the Anaconda Copper Mining Co.—has announced that it will enter the aluminum-production field by building a 72,000-ton capacity plant at Kalispell, Mont.

Two aspects of the power situation involved in these plants are worthy of note. Fifty-eight percent of the planned expansion, or 393,000 tons, will depend upon natural gas as the source of electric energy instead of water power. Energy for 85,000 tons, or 12.5 percent, will be generated by using lignite as fuel for the first time in the history of the aluminum industry in the United States. This will be done at Alcoa's new Rockdale, Texas, plant.

Increase Already Felt

Metal from this giant expansion program has already begun to contribute to the nation's aluminum needs. During 1951 approximately 75,000 tons of new annual capacity was placed in operation. The balance of the 677,000 tons of new capacity au-

thorized by the Government is scheduled to come into operation periodically throughout 1952 and the first half of 1953. It is of interest to note that of the 1951 production mentioned in the opening sentence, approximately 70 percent went directly into military uses.

The aluminum reduction works mentioned above make their aluminum from alumina, which is refined or extracted from crude bauxite. Additional needed alumina capacity consists of a new plant being built by Alcoa at Bauxite, Ark., with a rated capacity of about 400,000 tons of alumina per year, a new plant to be built by Reynolds near Corpus Christi, Texas. with an annual capacity of about 365,000 tons of alumina, and substantial additions to Alcoa's Mobile plant and Kaiser's Baton Rouge plant.

Foreign Sources Important

Alumina is made from bauxite. Bauxite is the only commercial ore of aluminum in use today, as far as we know. The bauxite supply for the expansion program, estimated at about 5,500,000 tons per year, will come from Arkansas, Suriname, British Guiana, and Jamaica. The Arkansas output will for the most part consist of material of such low grade as to have been classified as non-commercial 10 years ago. Of the total bauxite requirements, Arkansas will supply about one-third, and imports, mostly from Suriname and Jamaica, will supply the balance. The most noteworthy feature in the bauxite situation is the entrance of Jamaica into the list of producers. Reynolds Metals Co. expects to complete its substantial mining, drying, transporting and loading installations, and to begin shipments from the north coast of Jamaica in 1952. The aim is to take about one-half of all its requirements from Jamaica and one-half from Arkansas, so that as the Jamaica production increases, Arkansas production will correspondingly decrease. Likewise, Kaiser is making preparations to import bauxite from Jamaica. The latter firm is on record as having expended $10,000,000 to date on its Jamaican enterprise and to have purchased or optioned more than 11,000 acres of British West Indies properties in what Kaiser describes as "its first step toward obtaining an independent 50-year ore reserve."

Magnesium Plants Reopened

Where the aluminum productive capacity will have been increased 90 percent over the pre-Korean output, the output of magnesium, which totaled 15,726 tons in 1950, will have been increased eightfold over that figure when the six government-owned plants built in World War II and recently reactivated are in full production. Five companies have executed management contracts with the General Services Administration covering these plants whose entire output is expected to be diverted to military purposes or the Government stockpile. Total productive capacity for magnesium is expected to reach 122,000 tons, of which 98,000 tons will come from reactivated facilities and 24,000 tons from Dow Chemical Co.'s plant at Freeport, Texas.

The ferrosilicon process will be used at four of the reactivated plants. The electrolytic reduction of magnesium chloride obtained from sea water is used at two of them. All of the plants are already in operation, although it is problematical when all of them will reach their rated capacity. However, the situation today, as to magnesium supply, is such that the immediate future is brighter for this metal than for aluminum.

Strip Mining of Coal

(*Continued from page* 71)

with production at the rate of 75-80 tph using a four-man crew. In seams thicker than 60 in. current practice is to use smaller augers and bore two holes, one above the other. The most recent development in the design of augers is the bearing supports to prevent the auger flight from touching the coal, consequently eliminating edge wear and gravity drop or hole curvature. Theoretical recovery is about 78 percent if holes are drilled tangent to one another and to the floor and roof of the seam. In actual practice the average recovery is around 60 percent. The practical length of auger frames now in use being about 60 ft it is necessary to leave a flat pit of this width with a clean highwall which dictates prompt follow-up with the auger operation after stripping is completed.

Focus on Preparation

As the coal market becomes more selective, preparation of strip coal continues to receive special attention. Both from a quality and recovery standpoint, more precise cleaning is being installed in existing plants as well as new ones. There is also more extensive use of secondary dewatering and recovery of ultra fines, until recently not considered worth recovering. The advantage of large areas in the strip pit for the disposal of slurry discouraged the operators in providing expensive equipment for this purpose. Preparation in 1951 featured installation of washing facilities ranging from small packaged units using dense media to the largest commercial bituminous coal cleaning plant in existence. The Georgetown plant of the Hanna Coal Co., costing over $5,000,000 with capacity of 1500 tph of raw coal, uses three distinct circuits and three different types of equipment to wash the different sizes. To dry the fine coal, minus 1½ in., three different types of dryers are used—one mechanical and two thermal. Mechanical blending and loading facilities are employed with a special electric system for assembly of trains by automatic control from a switchboard in the scale house.

United Electric Coal Co. has installed a froth flotation plant on a floating dock for the recovery and treatment of slurry discarded in previous years. This plant reclaims 40 tph of merchantable coal from the pond with a five-man crew. Main plant wastes will also be conveyed directly to the flotation plant.

Land reclamation has kept pace with progress in all other phases of strip mining. Work done included scientific reforestation, development of spoilbank pasture, and creation of recreation areas. Production of timber crops, after several years of planting and experimentation, has proved successful. Several companies are cutting fence posts, poles and mine timbers of locust, pine and other tree species. The use of strip areas for recreational purposes is general in all sections and the general public is making wide use of the facilities provided.

Forty tons of coal is on its way in a bottom dump coal hauler

Production of iron ore in Western states continued its upward trend

Iron Ore

All-Time Record Year a Milestone in Progress Toward Even Greater Production

By R. T. ELSTAD
President
Oliver Iron Mining Co.

THE iron and steel industry of the United States, almost entirely dependent upon domestic iron ore deposits for this vital raw material, has since 1940 made rapid increases in production and facilities. In order to supply steel for World War II, and to meet the demand for an expanding national economy with a rising standard of living—and, to cope with the present defense program, resulting from the military conflict in Korea, the annual steel capacity of this country has risen from about 82,000,000 net tons in 1940 to 104,000,000 net tons in early 1951. Steel expansion programs now under way indicate a further increase in this figure to 118,000,000 net tons by 1953. Expressed in another way, the nation's steel industry will soon show an increase over its 1940 capacity of about 45 percent.

The amount of iron ore required for this steel program has likewise increased. To attain the steel industry's goal for 1953, will require about 135,000,000 gross tons of iron ore as compared with this year's production of over 115,000,000 gross tons.

The iron ore industry, alert to its responsibility to furnish the needed raw material, is expanding on three general fronts—in active domestic ore fields, new foreign ore fields and in the development of taconite.

In the exploration and development of present working ore fields, extensive work is under way in the Lake Superior District. Although exploration has not located any important new ranges, there have been found extensions of known ore bodies. This district produced over 80 percent of

Vessel shipments of Lake Superior Iron Ore totaled 89,092,012 tons with over 4,000,000 tons more shipped by rail

the more than 115,000,000 gross tons of iron ore from domestic mines in 1951. During the next few years, before substantial tonnages of ore arrive from the new foreign fields, it can expect an annual production requirement of 100,000,000 gross tons per year.

Accelerated stripping programs to uncover the open pit ore are under way using improved techniques and larger equipment. New beneficiation plants to treat the soft low grade ores are being built to increase the 24,000,000 gross tons of concentrates now produced annually in 58 plants. New underground mines are being developed that will increase the present underground production of 20,000,000 gross tons per year. The Lake Superior District will continue its major role as the outstanding domestic ore producer.

In the western and southeastern states, explorations continue at an increased rate. These areas are able to furnish the ore necessary to meet the demands of added steel capacities in their respective districts. In the northeastern states, the mines are increasing their production but are unable to keep up with expanding steel furnace requirements. Output from these areas totaled about 22,000,000 gross tons in 1951.

Foreign Ore Arrived

The exploration and development of new foreign ore sources is making rapid progress. Exploration work at Steep Rock Lake in Canada has shown this deposit to be larger than was originally expected. American ore and steel interests are investigating this deposit which is well located for using the Great Lakes transportation system. Present development plans, it is reported, call for a production rate of 3,500,000 to 4,000,000 tons annually with a hoped-for annual production of 9,000,000 tons after complete development of the area.

Iron Ore Co. of Canada is rapidly progressing on a program of developing their Labrador-Quebec deposit. Ore shipments are expected to commence in 1954 or 1955 and shortly thereafter to reach a rate of 10,000,000 tons annually. This project, from vessel loading dock on the St. Lawrence River to the mines, 350 miles inland, is a major mining undertaking of great potential importance to the steel industry.

This year marked the arrival of initial shipments of ore from Liberia and Venezuela. These new developments, it is expected, will soon reach a total production of 5,000,000 annual tons.

There has also been interest shown in the newly discovered ore fields of Venezuela by several major U. S. steel companies. The operation of ore concessions is at present in the process of negotiation with the Venezuelan government. These deposits are about 260 miles inland from the coast, requiring large investments in expensive river and rail transportation systems, in addition to an ocean haul of 2,400 miles to the Atlantic Coast of the United States.

Accelerated stripping programs are under way to undercover additional open pit iron ore

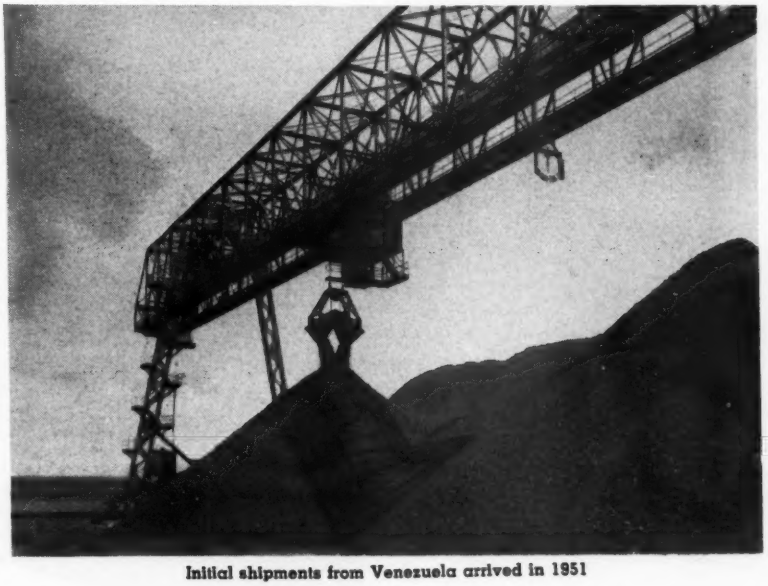
Taconite Developments

Much progress has been made in the taconite fields of the Lake Superior District. One pilot plant has been operating two years, and two plants are to be placed in operation next year. This experimental work by major steel companies, to obtain basic information to be used in the consideration of commercial plants, is costing a total of about $40,000,000.

One group of steel companies has begun work on a 2,500,000 annual ton commerical taconite plant in Minnesota with railroad, power plant and vessel-loading dock, to cost in excess of $75,000,000. The development of taconites is moving at the most rapid rate. Under most favorable conditions, 15,000,000 annual tons of taconite product can be expected by 1960.

The importance of the development of this ore source within the United States is of vast national significance.

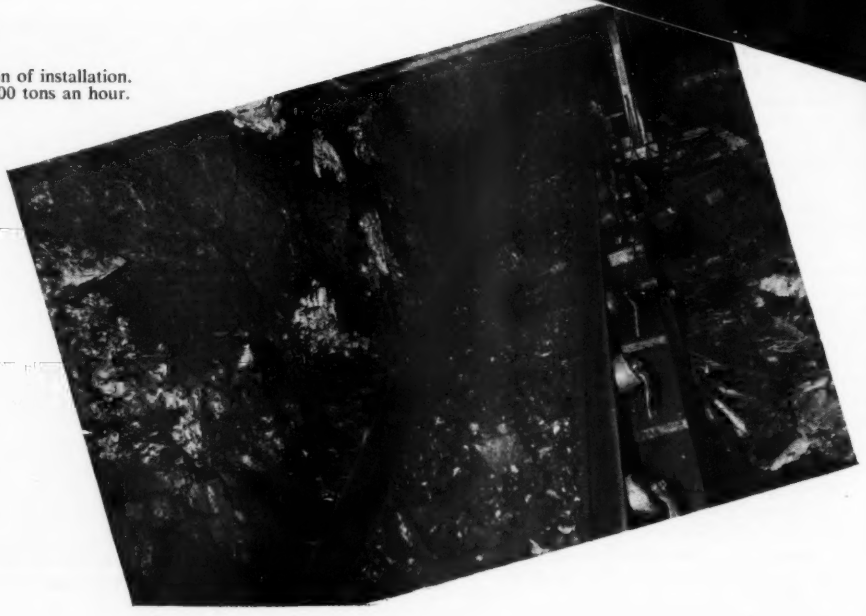
A comparison of the development of distant foreign fields with the availability of these domestic ores during war emergencies, is being given proper and serious consideration. The costs of these foreign ore developments on commenced and completed projects, excluding the Cerro Bolivar ventures in Venezuela,, total roughly $300,000,000. For the development of taconites, an additional $115,000,000 are already committed. This estimated $415,000,000, considered only the beginning, is financed by companies in the industry to promote new ore sources. For years the iron and steel industry has maintained a record of dependability to this nation that remains unchallenged. It has never failed. It is the key to our industrial strength and to our potential military might. The industry will continue to fulfill its responsibilities and obligations to the people of this nation as long as we continue to have a sound and strong private enterprise system.



Initial shipments from Venezuela arrived in 1951

Belt gallery between mine portal and tipple.

Central section of installation. Belt carries 400 tons an hour.



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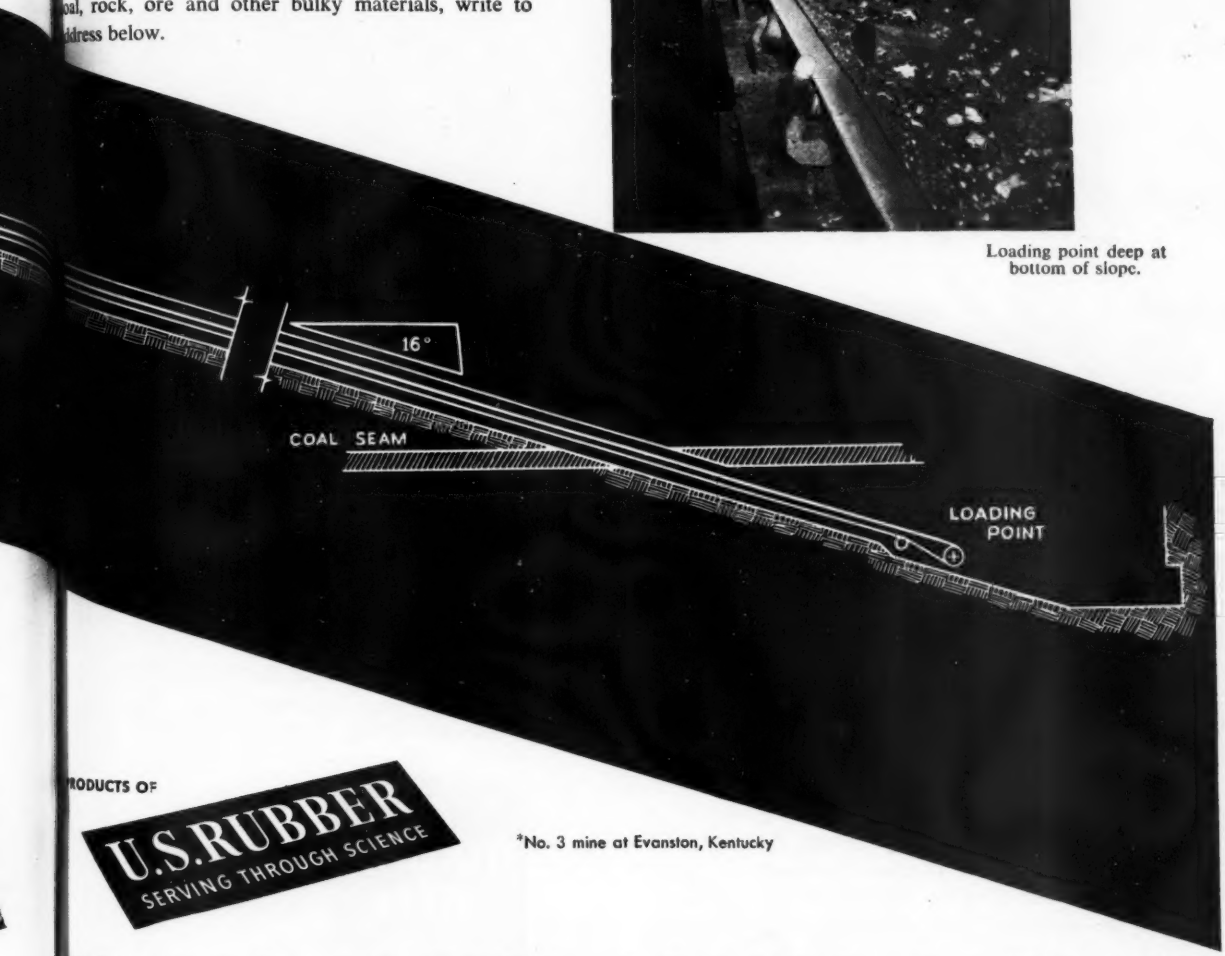
Loading point deep at bottom of slope.



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UNITED STATES RUBBER COMPANY

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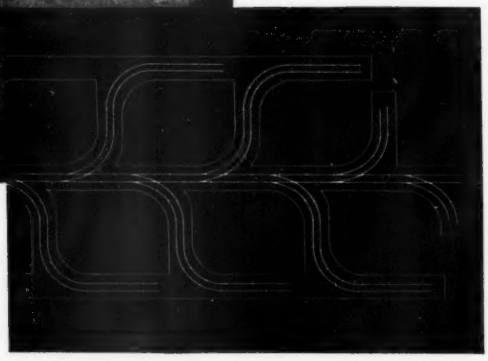

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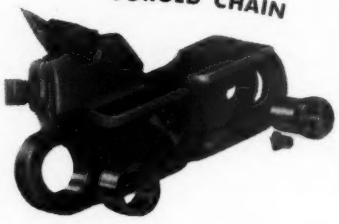

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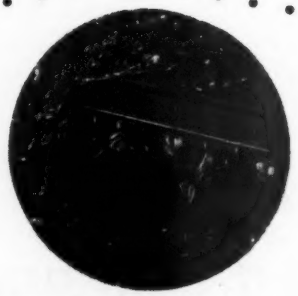

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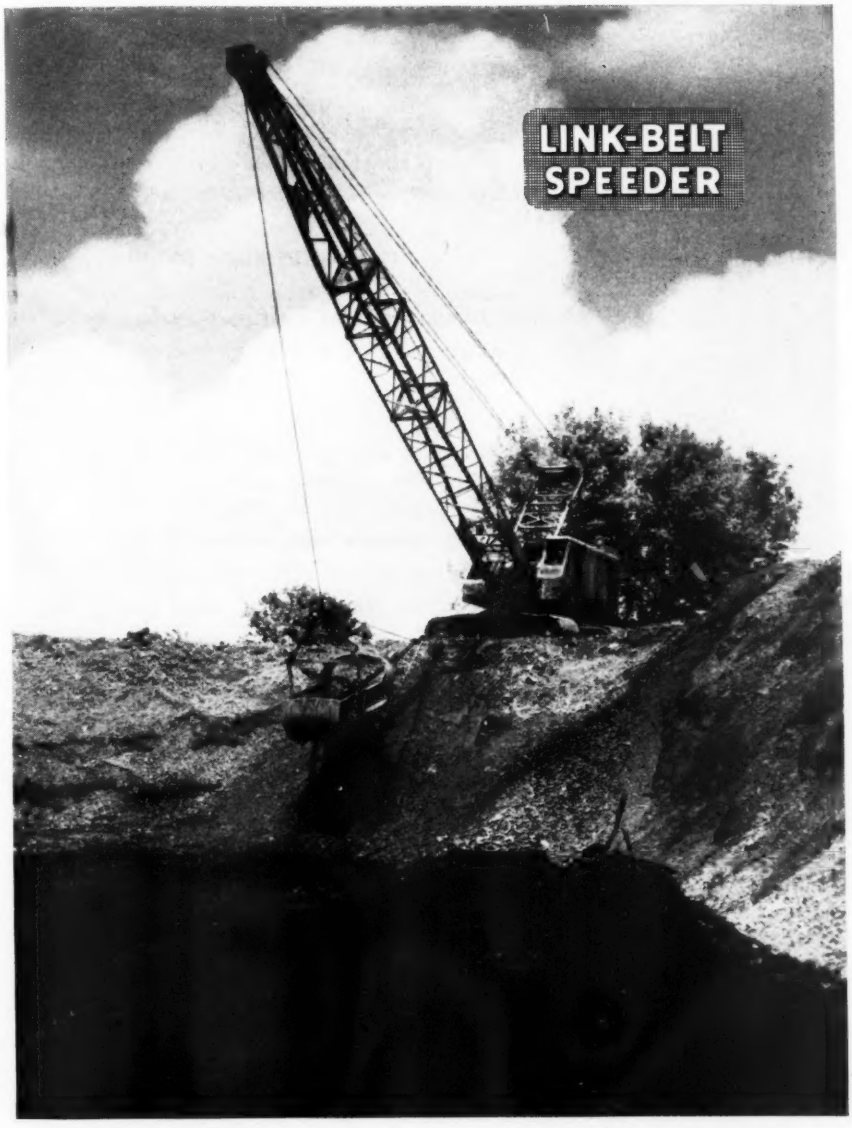

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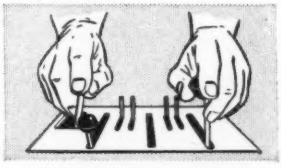
Speed-o-Matic full hydraulic controls mean stepped-up production



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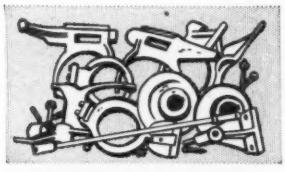

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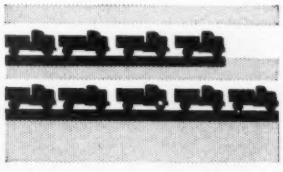

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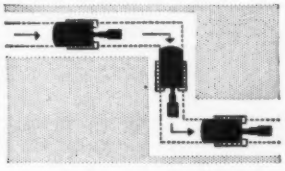

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Heavy-duty construction, fewer moving parts and protected lubrication keep Gardner-Denver Mine Car Loaders underground—enable you to plan on using your Gardner-Denver Loader 'round the clock, at several different faces.

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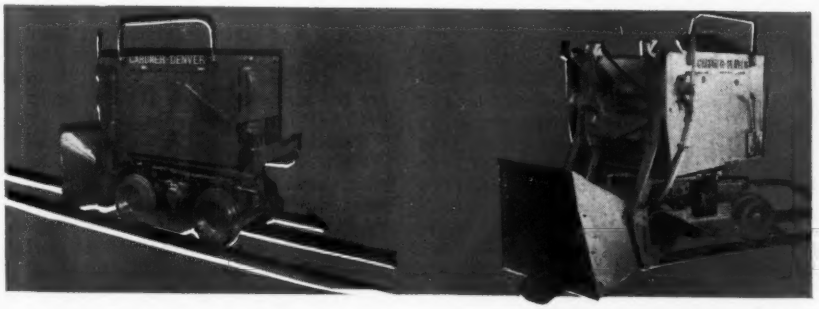

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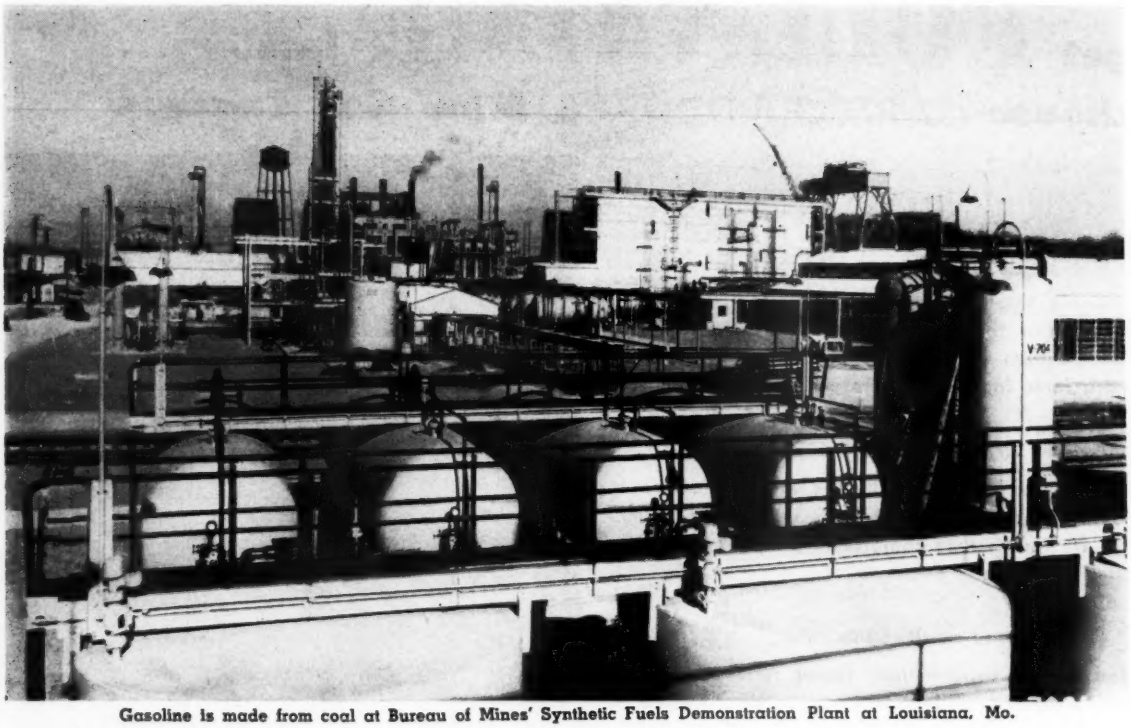


Gasoline is made from coal at Bureau of Mines' Synthetic Fuels Demonstration Plant at Louisiana, Mo.

Bituminous Coal Research

Basic Investigation into Coal's Physical Properties Is Matched by Studies Toward Improved Mining, Beneficiation and Utilization

By A. C. RICHARDSON, H. W. NELSON and R. B. ENGDAHL
Battelle Memorial Institute

MANY phases of the inter-related processes for applying to a variety of uses our enormous deposits of bituminous coal continued to receive the intensive attention of researchers during 1951. Probably the greatest concentration of attention was focused on the conversion of coal into fluid fuels, but mining, preparation, carbonization, and direct utilization also were subjects for considerable research.

Research in Mining

During the past year, research has been directed toward improving the recovery of mineable coal, the working of thinner beds, and an over-all reduction in the cost of production. Principal efforts have been devoted to increasing mechanization. In bituminous coal mining, the development and improvement of continuous mining machines has received major attention and several types are under investigation. Auger and core type machines are being developed for mining in thin and pitching seams. The U. S. Bureau of Mines has just completed an investigation of the extraction of pillars with mechanized equipment. Conveyors and shuttle cars have been modified and improved.

Roof bolting studies are being carried out by State and Federal agencies and by many mining companies. Its use is increasing rapidly. Airdox is being used to break an increasing tonnage of coal, but the search for other explosive substitutes continues.

Definitely related to mining is the research work being done on the cause and control of acid mine water. Numerous agencies have been engaged in this work and their studies have shown that sulphur-oxidizing bacteria play a very important part in the production of acid mine water.

Coal Preparation

During the year, federal, state, and other agencies have continued research work on the composition, chemical, and physical properties of coal. Federal and state organizations have continued washability studies on coal beds, and at the present time there are few major coal beds of the country that have not been investigated.

Practically all phases of coal preparation are receiving study in the bituminous coal fields. Much development work is being done on heavy-media processes. including experimentation with various kinds of suspensions and machines by both equipment manufacturers and coal producers. The U. S. Bureau of Mines is making a study of the fundamentals involved in heavy-media separation on both coarse- and fine-size coal.

Probably no coal-cleaning device, at the present time, is subject to as much investigation as the wet cyclone. It is being evaluated as a deslimer, classifier, coal-cleaning unit, heavy-media unit, and water clarifier.

Cleaning of fines with attendant operations is continuing to receive serious study. Feed rates to jigs treating unsized feeds are being reduced in order to treat the fines more effectively. Flotation and wet cyclones with media are methods on which there are research projects at present. Application of the Elmore vacuum flotation process to fine coal is being studied. Some research work is being done on the dewatering of fine coal with screens, centrifuges, and filters, and the use of wetting agents is being evaluated.

Considerable effort and study are being devoted to the prevention of stream pollution and gob fires. Transporting coal with water by pipe line has shown sufficient possibilities to warrant the construction by the Pittsburgh Consolidation Coal Co. of a full-scale demonstration line three miles long.

Defense requirements have led to some research projects not usually considered in connection with coal preparation. One of these is the recovery of a very-low-ash coal for the production of electrode carbon and synthetic liquid fuel. Another, is the recovery of pyrites from washery refuse to be used as a source of sulphur.

For the most part, research work on coal preparation deals with the application of known principles and processes to specific problems. A relatively small proportion is being applied to the study of underlying fundamentals.

Synthetic Liquid Fuels

Hydrogenation studies continued to be a subject for research at the Coal Research Laboratory of the Carnegie Institute of Technology, the U. S. Bureau of Mines, and some laboratories in industry. At Louisiana, Mo., in the USBM coal-hydrogenation plant, an uninterrupted run lasting two months was completed. A total of 2600 tons of Kentucky coal was processed into oil, with a yield of 3.7 bbl of oil per ton of dry coal. The oil was converted to high-octane gasoline in vapor-phase operations.

The proposal of the Department of the Interior to construct a full-scale coal-hydrogenation plant for synthetic liquid fuels met with sharp criticism from the petroleum industry. A recent economic appraisal by the Bureau concluded that a commercial coal-hydrogenation process could produce liquid fuels at a cost virtually competitive with similar fuels refined from petroleum. In its report, the ability of the hydrogenation process to produce urgently needed chemicals such a benzene, toluene, naphthalene, and tar acid derivatives was emphasized.

Union Carbide & Chemical Corp. announced that construction is in progress at Institute, W. Va., on a 300-ton-per-day coal-hydrogenation plant. The plant will produce such chemical raw materials as benzene, toluene, tar acids, naphthalene, special carbons, and pitch coke, as well as gasoline.

An oil-from-coal plant is under construction in South Africa. The new plant will initially produce about 60,000,000 gal of gasoline and diesel fuel. Capacity will later be increased to 100,000,000 gal, about a third of South Africa's requirements. The synthesis step will be carried on by improved versions of the Fischer-Tropsch process, one of which is the Kellogg-developed Synthol process. Lurgi gasification units will produce the synthesis gas required. By-products will be tar oils and acids, ammonia, and organic solvents.

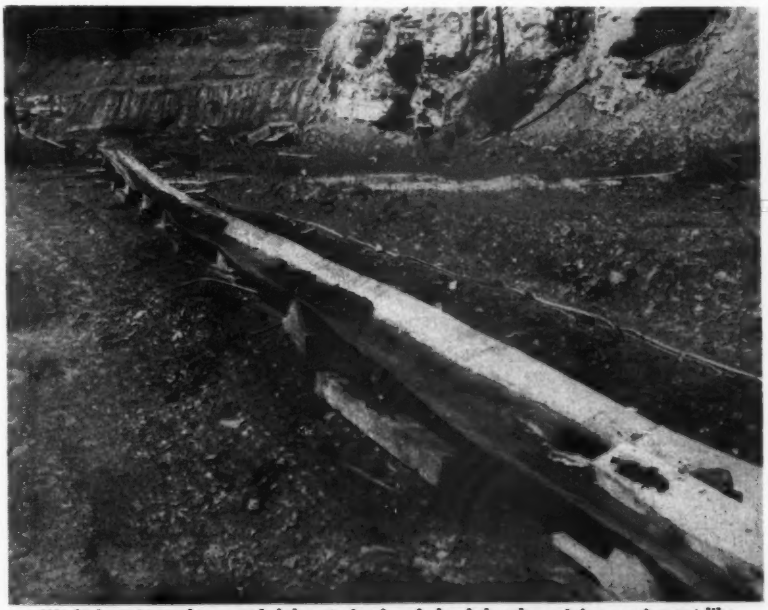
Coking Capacity Increased

Chief concern of the carbonization industry was the construction of new ovens and the rehabilitation of old ones. About 750 new ovens were placed in operation under an accelerated construction program. As a result the trend of the past two years, a decline in actual capacity of 1,222,000 tons, was reversed, although the net gain in new coking capacity during 1951 was not more than 2,000,000 tons.

Increased coke production has led to concern regarding the reserves of good coking coals of this country. The U. S. Bureau of Mines and the U. S. Geological Survey were active during the year in reassessing reserves on a more realistic basis. Work of the Bureau covers three main phases: (1) estimation of known mineral reserves; (2) preparation studies of these coals; and (3) tests of carbonizing properties and yields. Of particular significance is the finding that in some of the areas producing the best coking coals, the average actual recovery still amounts to only one-half of the total coal in the ground. Any improvements in mining methods to increase recovery would be of material benefit to our recoverable reserves.

There were no major developments in ovens or carbonization equipment for the production of metallurgical coke. Interest in research on the upgrading and use of marginal coking coals continued in this country and in England, Germany, and France. Methods have included the addition of small quantities of pitch or oil, mild hydrogenation or deoxidation, and special beneficiation methods. An interesting approach to the upgrading of weakly coking coals was studied at the Thionville coke plant in France. The process involves the concentration of the petrographic constituents vitrain and clarain by selective impact pulverization and screening. The resulting fraction, when blended with 50 percent of a good coking coal, is said to produce a coke satisfactory for metallurgical purposes. Blending of coals has continued to receive attention to control yields of coke, expansion pressures, and coke quality. Particularly in the western section of the country, methods of blending have been studied to permit the use of inferior and marginal coking coals which in themselves do not produce good coke. Tests are also in progress on the use of low-temperature char to replace low-volatile coal which must be shipped in from distant sources.

The Institute of Gas Technology re-



Work done in coal research laboratories has helped develop mining equipment like the extensible shaking conveyor

cently completed for the American Gas Association a study on the expansion behavior of coals during carbonization. Spooner, in England, showed that a relationship exists between swelling power and an expression relating the percentages of oxygen and hydrogen in the coal.

Two developments in the carbonization field attracted considerable attention in 1951, both involving low-temperature carbonization of coal by fluidized-bed techniques. The first of these was proposed as a result of a cooperative investigation by the Bureau of Mines and the Texas Power & Light Co. By this system, developed by V. F. Parry, a char is produced from lignite with the recovery of primary tar and some gas. The proposed system involves the use of this char in a steam power plant furnishing electricity for the Aluminum Co. of America aluminum plant in Milam County, Texas. The process is said to be applicable to any coal of lesser rank than high-volatile bituminous B, which includes about 90 percent of all western coals. By using lignite char to fuel its power-generating plant, Alcoa expects to get energy for aluminum reduction at about 3.5 mills per kwh. Credit from tar and oil by-products might reduce this to 2.5 mills. Estimates of processing costs, with by-product tar recovery and sale, would put the lignite char on a par with natural gas selling at from five to eight cents per 1000 cu ft, if mining costs, as claimed, are in the $1-1.50 range. Costs of that order can only be achieved where the coal-overburden ratio is very high, and transportation costs are low.

At its laboratories in Library, Pa., the Pittsburgh Consolidation Coal Co. is continuing an intensive program of research on a low-temperature carbonization process for use with high-volatile eastern coals. A fluidized-bed process is used, which operates successfully on strongly coking coals. From one ton of Pittsburgh bed coal, about 1400 lb of char, 37 gal of tar, and gas representing 1,000,000 Btu are recovered. Much of their current research work is concerned with determining tar-refining techniques and constituents of the tar.

Everett Gorin, of the Pitt-Consol staff, was recently awarded a United States patent for a method of generating electricity directly by means of a fuel cell. The cell is immersed in a fluidized reactor into which steam is admitted to generate water gas.

Gasification

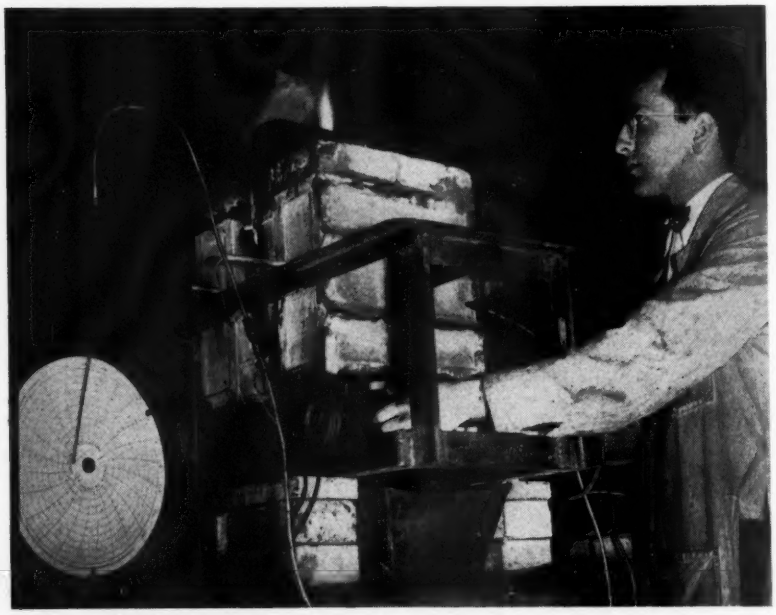
The Bureau of Mines continued studies of gasification methods for the production of synthesis gas. At the Synthesis Gas Branch, Morgantown, W. Va., two pilot-plant units were in operation, both involving gasification of pulverized coal by entrainment in oxygen and steam. The first unit operates at normal pressure, and has a capacity of 500 lb of coal per hour. The new unit is designed to operate at pressures up to 450 psi. Both have auxiliary equipment for superheating steam and oxygen, and for removing sulphur compounds and entrained solids from the gas.

Studies of the gasification of pulverized coal in a vortex system were made at the Pittsburgh branch of the Bureau. Work on the production of water gas from lignite was continued at the Bureau of Mines pilot-plant installation at Grand Forks, N. D. At Pittsburgh, the Bureau reported on results of a study covering the gasification of Alabama coals by the Lurgi system.

The research program at the Institute of Gas Technology included work on the gasification of pulverized coal in suspension with oxygen. At the University of Washington, Moulton and co-workers studied gasification of the subbituminous coals of Washington. Work on a pulverized-coal system was reported, and additional work involving a three-stage fluidization process is currently in progress. Work on gas producers was carried on at Battelle Memorial Institute on a cooperative project sponsored by Bituminous Coal Research, Inc., the Glass Container Manufacturers Institute, Pittsburgh Plate Glass Co., Westinghouse Electric Corp., General Electric Co., and six member companies of the Diesel Engine Manufacturers Association.

In England, the Gas Research Board reported on research on a combined process of hydrogenation and gasification of coal under pressure. A major objective is the production of high-Btu gas. In another project, a series of fluidized-bed reactors was studied, each operated at successively lower temperatures. Production of a gas rich in methane and a char suitable for power plants were the objectives of this study. Work was also carried on by the Institute of Gas Engineers and Leeds University on improvements in the Lurgi process. In France, a demonstration plant using the Panindco process was built. The Panindco process is a method of gasifying pulverized coal in suspension, with use of some oxygen together with high superheat.

Work on gasification was active in Germany. Ruhrgas A.G. continued work on an air-blown pulverized-coal producer with slagging ash removal. One version of this study includes pulsatory gasification. Construction of a pilot plant for tests of the Flesch-Demag process was completed recently by Demag A.G., Fuisberg, Germany. The process is carried on in a two-shaft system of downdraft gasification. Each shaft is fluidized at intervals of the operating cycle, when clinker is removed and fresh coal is added to the inventory of fuel in the shaft. Koelbel, of the Rheinpreussen Coal Co., reported on a modification of the Fischer-Tropsch process in which the hydrogen of the gas mixture is replaced by steam. Gas containing oxides of carbon are mixed with steam, and the mixture directed over a catalyst at normal or high pressure and at temperatures in the range of 150° to 300° C.



Coal testing equipment is used continuously at research centers

Underground gasification continued to receive attention in England, Belgium, and the United States. Tests by the Bureau of Mines at Gorgas, Ala., included a continuous run lasting for 22 months, during which 10,485 tons of coal were consumed. The test included operation of a gas turbine using the hot gases produced underground.

Utilization

Because of the large aggregate consumption of coal in small boiler plants most of the research effort directed toward improved utilization was aimed at equipment for small commercial and industrial users. However, important large-scale uses also received attention.

Major efforts in the small-plant field were aimed at improving consumer acceptance of coal-fired equipment through greater automaticity, reduction of dust emission, and improved efficiency. A completely automatic coal-fired steam generator was under development by BCR, at Battelle. Investigation of the possibilities for simplified dust collectors for small plants was also active.

At Penn State, observations continued of trial applications of the radiant refractory arch developed some years ago to broaden the range of coals suitable for industrial underfeed stokers.

An important parallel activity to this research for small plants was recently announced by the National Coal Association. Consulting services for small-plant designers and operators will be established in key areas in order to apply the best of existing knowledge on plant arrangement and equipment to assure the maximum convenience and economy in designs for the use of coal. As new research results became available these offices will serve also to promote rapidly the most effective application of the results.

Research on full-scale, large industrial boilers was continued in an effort to learn more about the behavior of coal particles and ash so that the already high level of performance achieved in some units can be reached and exceeded by others.

Under the auspices of the Special Research Committee on Furnace Performance Factors of the ASME, the Bureau of Mines began investigation of combustion conditions in a new large spreader-stoker-fired boiler at the Whiting, Ind., plant of Carbide & Carbon Chemicals Corp.

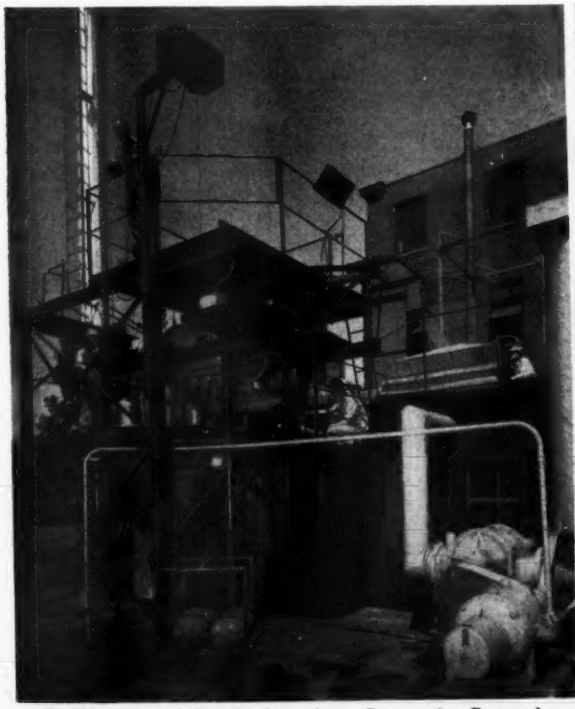
A major factor in increased consumption of coal was the continued, almost phenomenal rise in the consumption of electric power because of increased industrial activity, increased use of household labor-saving devices, and rising population.

While electric generating capacity in this country has nearly doubled since 1939, it is expected to triple its present capacity in the next 20 years. Coal will be called upon to supply an increasing proportion of the primary energy for power generation because of its greater long-range reserves and capacity for expansion. Research to promote the greater use of electricity for steel-melting was begun recently by a group representing the utilities in cooperation with BCR. A study was completed on the electric generating station as the source and sink for the heat pump. Other projects for the improvement and expansion of the use of coal by the electric utilities are under consideration.

Test Coal Gas Turbine

Work on the development of a coal-fired gas turbine locomotive continued at a high rate. A full-scale turbine designed for locomotive use was operated on part load with coal in order to determine the effect of the gases on the turbine blading and to provide experience in operating the coal-handling and preparation equipment. Parallel work on suitable combustion systems for a wide variety of coals was continued at the Canadian Bureau of Mines in Ottawa. At the British Fuel Research Station, work was resumed on the vortex combustor for the coal-fired turbine.

The activities of Bituminous Coal Research, Inc., were reviewed during 1951 by a Plan-of-Action Committee which was formed of coal company executives to recommend an enlarged program of research, engineering and technical promotion. The new program will probably be announced early in 1952.



An Experimental Gas Producer for a Cooperative Research Project

Technical research has made it possible to up-grade coal for metallurgical use

Underground mining continues near Garrison, Mont.

Phosphate

Trend Is Toward Bigger Mining Equipment and Permanent Treatment Plants

By JAMES A. BARR
Consulting Engineer

Florida

THERE was no new plant construction in 1951 other than projects started and announced in 1950. The production capacity remains about the same except for the usual improvement due to advances in techniques and normal plant changes.

The mining and beneficiation methods have not changed but there are several noticeable trends such as replacement of older dragline excavators with larger models with buckets ranging from 20 to 30-cu yd capacity as compared with 8 cu yd of the earlier years.

The increasing cost of beneficiation plants prohibits a move every four years as was a custom when a washer installation cost about $100,000 to $200,000, as against the present integrated installation which may well cost several million dollars.

As a result matrix is pumped longer distances, often a mile or more, with a move of the central plant once in 20 or 25 years. Swift & Co. have a five-mile pipe line.

Another trend of a longer range type is the increasing production of "mine mouth" triple-super phosphate to satisfy the increasing demand for higher grade plant food as well as for economic reasons.

The early practice was to ship ⅔ to ¾ of a (net) ton of phosphate rock to a fertilizer plant where it was acidulated with sulfuric acid to make a ton of 18 to 20 percent P_2O_5 super phosphate.

If the phosphate is converted to "triple super" it is possible to ship the same amount of plant food in about half the tonnage. Of course "commodity rates" govern since it is still approximately 50 percent cheaper to ship a unit weight of phosphorous in phosphate rock rather than in the form of elemental phosphorous.

The diminishing high grade "pebble" reserves has prompted one mining company executive to forecast that within 20 or 25 years Florida production would be mainly in the lower grades of 60 to 65 percent B.P.L. which is suitable for the manufacture of triple or multiple super phosphate and elemental phosphorous but not economic to ship to distant fertilizer plants for the manufacture of ordinary super phosphate.

There will always be a demand for the high grade for specialty uses and for economic reasons.

The same trends also apply to Western phosphates and have previously affected Tennessee practices. In the latter state high grade phosphate is no longer an appreciable item in the annual production figures and the over-all effect has been to very greatly increase commercial phosphate reserves.

Tennessee

Production continued in 1951 at about the same rate as in 1950 and went mainly to electric furnace plants or was ground and used as direct application to the soil.

There has been very little change in practices except that nearly all haulage from mine to plant is now by truck and the tendency is to use larger units of about 10-ton nominal capacity.

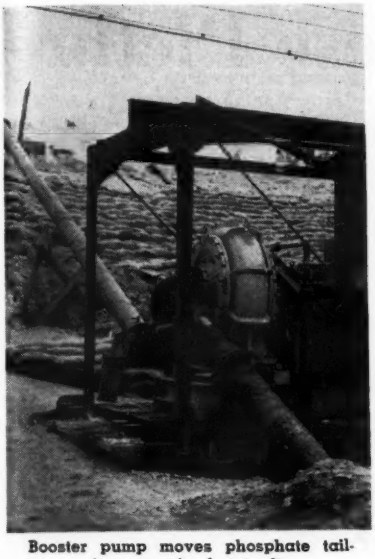
The day of the large blanket deposit has passed and most of the tonnage is mined from smaller and scattered deposits. Reserves of this nature are quite substantial.

Western States

There is one new integrated project under construction by the Monsanto Chemical Co. at Soda Springs, Idaho, where a strip mine is being opened to supply adjacent electric furnaces for the production of elemental phosphorous. This will be the third electric furnace installation in the west.

Underground mining continues near Garrison as well as the large stripping operation near Hall, Idaho.

Several investigations are under way leading toward the production



Booster pump moves phosphate tailings to mined out pits

of concentrated phosphate fertilizers to be produced both by the wet or sulphuric acid method and possibly from electric furnace elemental phosphorous.

The increased price of sulphur and the threat of continued shortages tends to narrow the economic gap between the use of electric furnace elemental phosphorous in fertilizers and the older processes previously mentioned.

The 1950 production of phosphate rock is given in the table below, taken from a release of the U. S. Bureau of Mines.

	Long tons
Florida Land Pebble	7,933,009
Florida Soft Rock	81,542
Florida Hard Rock	71,319
Tennessee Rock	1,384,473
Idaho and Wyoming	783,209
Total	10,253,552

There are now 25 electric furnaces producing elemental phosphorous in the U. S. with a capacity of about 80,000 tons of elemental phosphorous. By 1953 it is estimated there will be at least 30 furnaces with a capacity of 260,000 tons.*

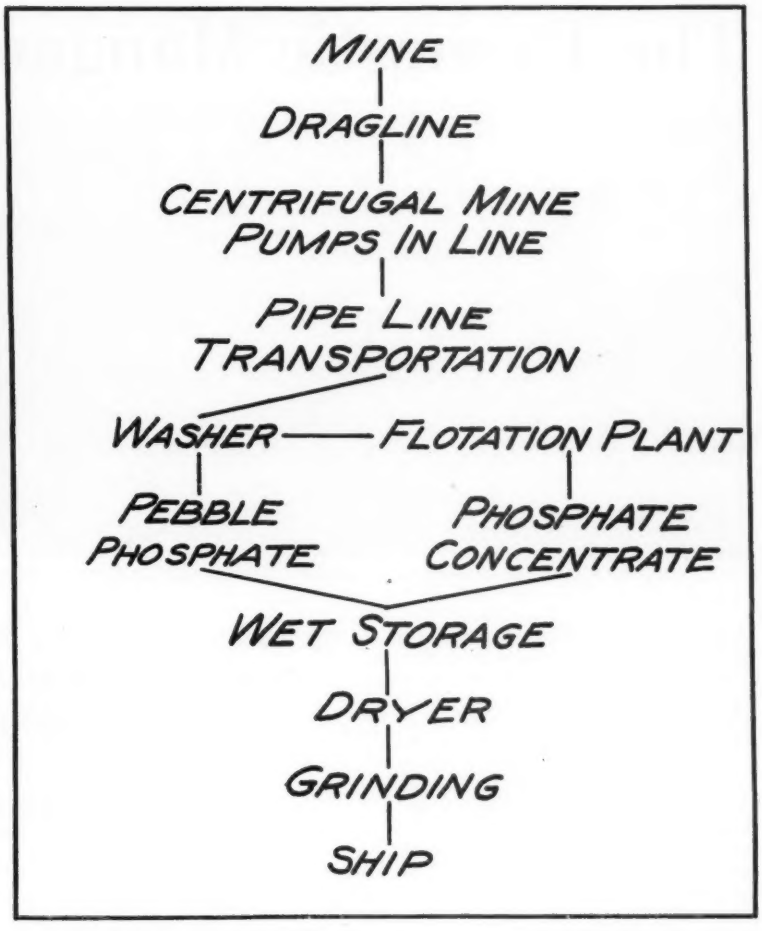
Foreign

Exports to Europe are down due both to shortage of dollar exchange and the effect of the sulphur shortage.

Russia has stepped up shipments to Norway, Sweden, Finland and behind the "Iron Curtain."

Shipments from North Africa to the Iron Curtain countries are increasing with total production of about 300,000 tons. French Morocco is holding steady at about 7,400,000 tons and Egyptian shipments show a a slight increase.

* "Phosphorous on the Rise"—Waggam, De. Chemical Engineering.

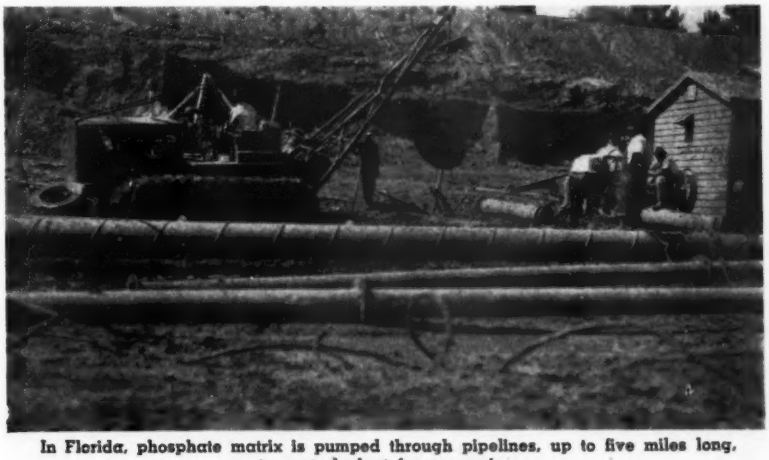


Ocean Island and Naru have rebuilt the installations wrecked in World War II and are back to full capacity of about 1,300,000 tons.

Japanese consumption is increasing tremendously. Shipments from Florida to Japan are up about 50 percent and will more than make up for decreased exports to Europe.

A Tribute

Mr. Bertrand Johnson is retiring this spring from the U. S. Bureau of Mines where he has been a specialist in handling phosphate statistics since 1926. The industry owes Mr. Johnson a vote of thanks for his efficient service over the many years.



In Florida, phosphate matrix is pumped through pipelines, up to five miles long, to central plant for processing

The Domestic Manganese Picture

World's largest known rhodochrosite deposit surrounds outlying veins in southwestern part of Butte, Mont. district

By No Means a "Have Not" Nation, We Lack High Grade Ores but Low Grade Deposits Can Help Solve Problem

By ARTHUR LINFORTH
Anaconda Copper Mining Co.

IT IS well known that manganese is an essential ingredient in the manufacture of steel as a deoxidizer or as an alloying material and it has no substitute in the desulphurizing of the melts. Little is produced in the form of pure metal, but it is largely converted from ore into ferro-manganese, spiegeleisen and ferro alloys. Consumption of manganese per short ton of steel, on a yearly average, ranges between 12 and 14 lb. With the modern demand for strength in steel, particularly in time of war, manganese is indispensable. In fact, it has been said that, in war time, a sufficient supply of manganese would be more valuable than the gold at Fort Knox.

In the manufacture of steel, manganese is added in the form of its alloys, chiefly ferro-manganese, for which the standard specifications are 80 percent metallic manganese although in the last war this was reduced to 70 percent. Very definite specifications are set for the ore from which standard ferro-manganese is made. This classification is called ferro grade ore and must contain at least 35 percent manganese. The ferro maker requires 44 to 48 percent manganese in his furnace charge. He does not want over seven percent iron and the silica must not exceed 10 percent. Phosphorous is particularly objectionable in steel, so an upper limit of 0.15 percent has been set for that element in the ore. The presence of zinc affects the furnace linings, therefore the maximum allowance is only 1.0 percent.

Where is there enough ore which, of itself or by blending, will average around 48 percent manganese and meet all the other specifications? This country has not been able to find and produce more than 10 percent of its requirements. All the rest has to be imported. A recent picture of where it has been coming from is found in statements of the United States Bureau of Mines which show that imports of ferro grade ore were divided as follows:

MANGANESE IMPORTS 1951*

	April	May
India	42%	16%
Gold Coast	31	35
Union of S. Africa	12	16
Cuba	7	14
Angola		6
Mexico, Turkey, Belgian Congo, Chile, Peru, French Morocco, Philippines, Iran	8	13†
	100%	100%

* In 1948 USSR sent 38%; in 1950 none.
† Also includes Portugese and Asia.

Total consumption of manganese ore in 1951 was 2,106,000 short tons, while total domestic production was only about 100,000 short tons. In terms of contained manganese, Montana has been supplying as much as 95 percent of the domestic production. The balance is made up of relatively small shipments from Arkansas, New Mexico, Virginia and Arizona.

This country needs over 2,000,000 tons a year of a material which is vital to our national security. Domestic resources under present economic conditions will provide less than 10 percent of it. Montana will provide about 95 percent of our metallurgical production, mined at Butte. Practically all battery and chemical grade ore will come from Philipsburg.

Manganese constitutes a relatively late contribution to the production record of the Butte, Mont., mines. It had long been known that peculiar

geologic conditions surrounding some of the larger outlying veins, particularly in the southwestern part of the district, had created what is probably the largest deposit of rhodochrosite, or pink manganese ore, in the world. Although the manganese minerals occur all around the outer zone, they show no evidence of continuing below the 2100 level. They are frequently in the form of silicates or very siliceous mixtures of the carbonate whose manganese content is too low to constitute manganese ore under present economics.

No higher grade source of manganese with low impurities for the production of ferro-manganese is available to the steel makers from anywhere in the world than Anaconda's nodules. By the continual improvement of its metallurgical processes Anaconda has been able to reduce the required ore grade to 15.0 percent, thereby considerably increasing its resources.

If emergency conditions were imposed and more manganese had to be obtained, regardless of cost, then some of the presently sub-grade occurrences at Butte could enter the picture. If material containing as little as eight percent manganese could enter the ore stream, the Butte district might ultimately supply a couple of millions tons with an average grade of about 9.5 percent manganese in addition to the higher grade resources already developed. Of course, such material would require a lot of concentrating and the manganese would be expensive. Included in the Butte resources of both normal and sub-grade ore from which ferro could be made, are not only those of Anaconda, but of some independently owned outlying properties in the western part of the district, not presently operating.

There is no important black oxide manganese resource at Butte. During both World Wars, but particularly in the last one, practically every available occurrence of black oxide was mined by lessees. Requiring careful selection and hand sorting, from July, 1942 to January, 1945 there were 35,664 long dry tons mined in the Butte district, and sold to the Metals Reserve Co. The grade ran from 15 percent minimum to an occasional 40 percent. The average was about 20 percent. In case of another emergency, lessees would again scrape these outcrops with similar results, although the cream has been taken.

It has been estimated that even if the grade limit of this kind of material was to be reduced to eight percent manganese, the various outlying properties around Butte might provide 377,000 short tons with an average grade of around 12 percent, which would also need much concentrating.

In Montana, the Philipsburg district ranks second to Butte in respect to production and reserves of manganese ore. All other known occurrences are relatively unimportant from the standpoint of tonnage possibilities even if considered down to a minimum grade of eight percent manganese. The selective mining and milling of Philipsburg ores has yielded the best dry cell battery product yet found.

The ores occur in veins but more particularly as important replacement deposits, in limestone. So far the oxide types have predominated. If material containing as low as eight percent manganese is included, the developed and prospective ore might total 1,000,000 tons averaging 12.6 percent manganese.

Under the present set-up of the General Services Administration the only manganese ore which the government proposes to purchase in Montana must contain not less than 90 percent of its manganese as the carbonate. No depot for implementing such purchases has been established, and only one of the several potential but small independent operators has received any government assistance.

Thus accounted for are the resources from which 95 percent of the domestic output of metallurgical manganese has been coming. For the other five percent we must depend chiefly on Arkansas, New Mexico and Arizona. In general, these deposits are relatively small, but rich residual lens shaped concentrations formed in the weathering of manganiferous shales and limestones, like bauxite.

Low Grade Resources

Under present economic conditions, there is little hope of discovering important new bodies of ferro grade manganese ore. The experience of two wars, when there were substantial incentives for prospecting and developing, failed to discover a single important one in spite of the efforts of the United States Geological Survey, the Bureau of Mines, the State Geological Surveys, the mining companies and numerous individuals. Chances of finding them in the future, even with increased incentives, are becoming less likely. While this country is lacking in deposits of ferro grade ore, it is by no means a "have not" nation in manganese. The only foreseeable means of making the United States at least partly self-sufficient in this commodity lies in the utilization of its low grade deposits. They can be made to yield a useable product after beneficiation, but have received little attention because of economic or technologic problems. The most spectacular example is found in the Missouri Valley deposits at Chamberlain, S. D., where sufficient manganiferous material in outcrop or lightly covered zones exists to constitute a supply of manganese equal to the full national requirement at the present rate of consumption for approximately 20 years.

In addition to this enormous occurrence there are the large low grade deposits of the Cuyuna Range in Minnesota, at Artilley Peak in Arizona, and the Three Kids deposit in Nevada.

All have difficult technical problems in mining or metallurgy or both; the fact remains, however, that they are here. The challenge is to find the means of turning them into a product of satisfactory grade as cheaply as possible, rather than face a war emergency with the forlorn hope of discovering new high grade deposits. A lot of study has already been given to these low grade manganese deposits and several beneficiating processes have been proposed. Nothing developed thus far would approach a commercial operation at present, but this country could become practically self-sufficient in manganese.

It is urged, therefore, that research be continued to sort out present information and proposed processes, to adopt the best one, to build pilot plants and to install the most appropriate plants for beneficiation. We can say that we have the ore.

Mining of the Chamberlain deposit would all be on the surface. The weighted average width of the outcrop of the ore bed, as given by the Bureau of Mines, is 190 ft and the peripheral boundary is 523 miles. The ore bed itself averages 40 ft thick. The average width of the outcrop zone for ore which has a stripping ratio of ½ to 1 is 175 ft and also a length of 523 miles. It is estimated to contain 2,486,000,000 short tons with an average grade of 1.5 percent manganese. Concentrates have an average grade of 15.5 percent. The U. S. Bureau of Mines has found out how to perform this concentration. But since they are complex manganese carbonates, they would probably have to be treated chemically.

With such extensive surface exposures and such a vast total tonnage, the annual mine production might be as large as desired unless various physical features proved too much of a handicap.

Production from the other low-grade deposits would be on a much lower scale as they would be limited by the smaller size of the ore bodies, but they would make important additions to the domestic supply.

At Cuyuna the rocks are steeply dipping, highly folded, well bedded slates, quartzites and cherts. One of the beds can be traced in a series of synclines and anticlines over an area about six miles long and three miles wide. The manganese oxide minerals are confined to this bed and are remarkably continuous. The proven reserves have widths from 20 to 120 ft, averaging 12.8 percent manganese, and can be mined by top slicing meth-

Deposit	Short Tons	Grade	Mn Tons
Chamberlain Concentrates—outcrop	21,254,000	15.8%	3,358,132
Chamberlain Concentrates—½ to 1	56,500,000	15.4%	8,700,000
TOTAL CHAMBERLAIN	77,754,000	15.5%	12,058,132
Cuyuna	10,658,000	12.8%	1,364,224
Artillery Peak	2,000,000	13.0%	260,000
Three Kids	2,000,000	18.5%	370,000
TOTAL	92,412,000	15.2%	14,052,356

ods. A chemical metallurgy has been proposed for them.

Total production from these combined low grade ore bodies could be on a very large scale, possibly even enough when added to production from the higher grade sources to provide the equivalent of the nation's annual consumption for metallurgical purposes.

It is particularly significant to note that the average grade of these so-called low grade manganese deposits is estimated at 15.2 percent. Compare this with the average grade of 15 percent manganese in Butte ores which are supplying 95 percent of the domestic production.

Those impressive figures lose something of their significance when the problems relative to winning such tonnages are considered. The metallurgy will be complex and the earth moving procedures will assume very large proportions particularly at the Chamberlain deposit. Cost of production would be much greater than present prices allow even when the operations were well established.

In addition to the western deposits, there is an occurrence of carbonate ore in Hampshire County, Mass., which has attracted some attention, although production from it to date has been but nominal. It is said to average about 22 percent manganese, but its reserves and potentialities have not been established.

Manganese from Slag

A particularly important source of manganese for the steel makers may develop in their own back yards as the result of extensive research being carried on by them and the U. S. Bureau of Mines. This source is the furnace slag accumulated from many years of steel production. Both open hearth and Bessemer slags have been investigated, and several processes for the recovery of the manganese have been devised. Most of them are costly, but the resource is enormous, and close at hand because the recovery plants would be located at the respective steel works. Of 13 lbs of manganese necessary to make each ton of steel, it is estimated that as much as five lbs is discarded in the slag. Therefore, on the basis of an annual production of 100,000,000 net tons of steel, about 400,000 tons of manganese enters the steel products and about 250,000 tons of manganese goes to dump with the slag each year. Thus the annual accumulation in the slag approximates more than a third of the total annual requirement, to say nothing of the total accumulation to date. This is indeed a tremendous resource, if it can be used.

Regarding present recovery of manganese by concentration from the low grade domestic ores, the following observation from the records of the Bureau of Mines may be made.

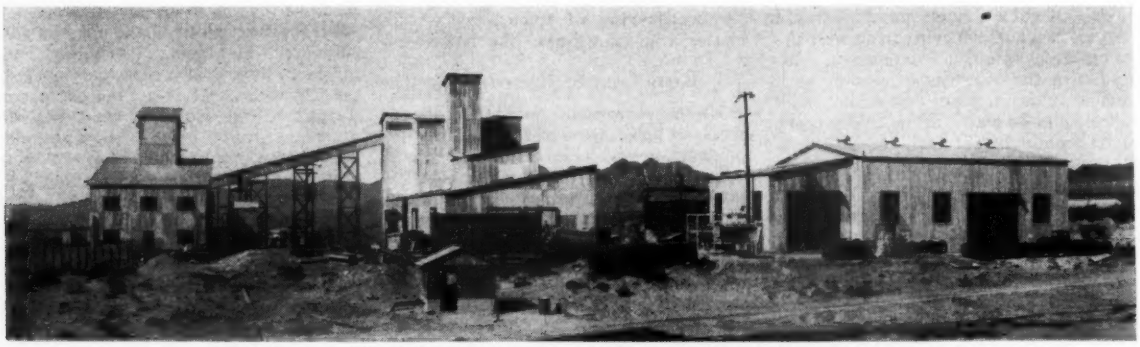
How Ores Can Be Used

According to the USBM, the oxide ores which constitute most of the known deposits can virtually all be beneficiated to some extent, although never as well as the carbonate ores. High grade oxides are readily concentrated except when iron oxide or finely disseminated siliceous gangue occurs. In such instances the silica content of the product is too high to meet the specifications for ferro grade ore. Concentration of the low grade oxides usually results in a large loss of the manganese as an untreatable slime. Straight carbonate ores like rhodochrosite are readily concentrated by flotation, but they are relatively scarce, except at Butte. Manganocalcite ores cannot be concentrated to high grade manganese products, nor can an effective separation be made by common concentration methods in the case of the silicate ores like rhodonite.

Four general methods of end-point utilization of low grade ores like the Chamberlain deposit have been considered.

(1) Direct utilization in the production of basic pig iron.
(2) Pyrometallurgical processes resulting in production of ferromanganese by multiple steps, matte smelting or other means.
(3) Chemical processes wherein usable manganese compounds are evolved by leaching and chemical means.
(4) Electrolytic processes involving the production of metallic manganese.

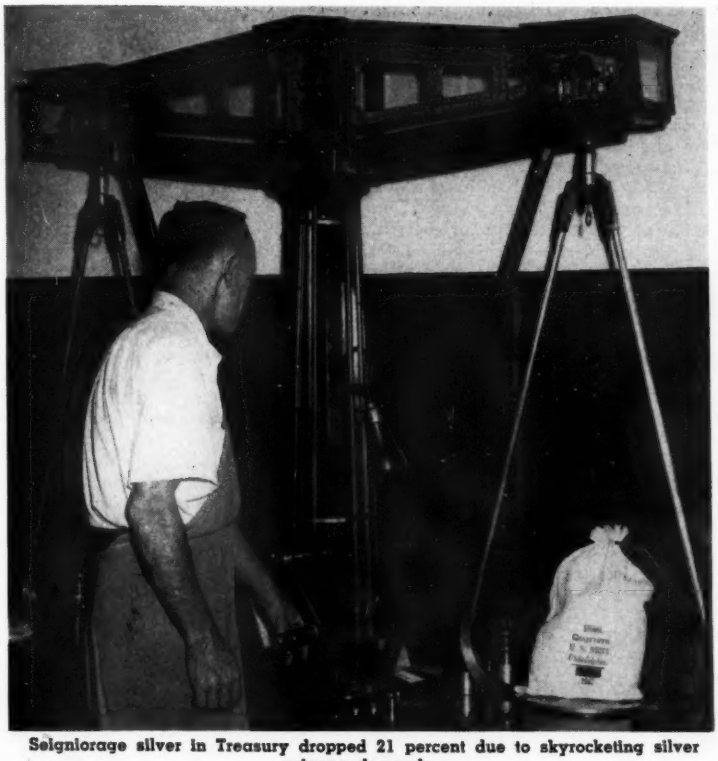
Chemical processes which have been considered include the use of ammonium sulphate, but during a war period, sufficient ammonia probably could not be diverted from other critical uses.



U. S. Bureau of Mines has found out how to treat some low grade manganese ores

There is also the acid process which leaches the manganese by means of sulphuric acid and evaporates the manganese sulphate solution. The resulting manganese sulphate crystals must then be calcined and nodulized.

The result of these observations is that this country is by no means a "have not" nation in manganese. It does lack high grade deposits, but it has plenty of low grade manganese. It also has a number of processes for treating them. Low grade though these resources may be and costly the processes, it is confidently believed that the utilization of them is the only safe way to solve the domestic manganese supply problem under emergency conditions.



Seigniorage silver in Treasury dropped 21 percent due to skyrocketing silver coinage demands

Silver Developments in 1951

Tight Supply Plus Increased Demand Will Force Rise In Ceiling Price

By HON. PAT McCARRAN
United States Senator from Nevada

THERE were many interesting developments in silver in the past year, some presaging favorable trends for producers of the precious metal. Outstanding events included:

(1) Rise in the New York market price to the highest level in 30 years.

(2) Cessation of Mexican silver exports to the United States.

(3) Greatly increased demand at home and abroad for silver coinage.

(4) Marked decline in seigniorage or "free" silver in the General Fund of the Treasury.

(5) Decrease in silver imports of 22 percent.

(6) OPS ceiling price placed at 90.16 cents per oz.

(7) Ever-tightening supplies for industrial use.

(8) Sale of 1,633,498 oz of Treasury silver to armed forces at 91 cents per oz.

World Price Rises

The market price in New York jumped from 80 cents an oz on January 2 to 90.16 cents on January 8, the highest level attained in 30 years. The price rise—long overdue—placed the market price a shade below the Treasury buying price for domestically mined silver—90.5 cents per oz.

Price movements were noted again in the summer and fall of the year. The silver quotation declined to 87.75 cents an oz on June 7 due to a seasonal factor inherent in the market, but recovered to 90.16 cents on June 28. On October 4 the price fell 5.4 cents an oz to 84.75 cents largely because of the combined action of inventory reductions by users and temporarily accumulating supplies from foreign sources. However, the following day the price recovered to 88 cents, at which point it remained for the balance of the year.

Aside from the increased influence of the Bank of Mexico on the market, there are two external factors now affecting the present and future price of the metal which were not in evidence at the close of 1950. One is implementation of the OPS ceiling price of 90.41 cents per oz on January 26. The other is the Treasury buying price of 90.5 cents for domestic silver. The former directly controls the market price while the Treasury price indirectly controls it through the legalized privilege accorded users to buy Treasury silver instead of commercial silver in the event of a market price rise beyond 90.5 cents per oz.

The London price followed the New York market quotations throughout the year. Reports have been circulating that part of the London demand is being satisfied with silver withdrawn from coinage, although the stated purpose of the extraction of silver from recalled coins is to repay Britain's lend-lease debt to the United States. No such repayments have been made by Britain so far.

Relative stability characterized the Bombay price throughout 1951. The price fluctuated gradually between 182 rupees per 100 tolas and 206 rupees (about $1.15 an oz). This was a higher price range than existed in 1950. The slowly ascending and descending quotations in 1951 constituted a peculiar characteristic of a market usually marked by sharp and often violent fluctuations in a short period of time.

Mexican Position Stronger

In June, Mexico announced a cessation of its silver exports for the remainder of 1951. Since Mexico is the world's largest producer and main source of United States industrial silver supply, this development lent increased stability to the commercial price and strengthened Mexico's position in the market. The Bank of Mexico explained that the reason for the halt in shipments was that her own plans for increased coinage supplemented by large orders for silver from Saudi Arabia, West Germany and Pakistan dictated the move.

Mexico, the world's largest producer, produced about 41,000,000 oz in 1951 compared with 49,000,000 oz in 1950.

Imports Off Sharply

Silver imports in 1951 were approximately 84,000,000 oz in ore, base and refined bullion as compared with 108,049,000 oz in the same categories in 1950—a decline of about 22 percent. The decline is attributable largely to greatly reduced exports from Mexico.

Imports of foreign coin in 1951 are valued at approximately $22,600,000 compared to the $26,881,000 in 1950. Actually, the silver content represented by the values was less in 1951 than the figures indicate since the price at which those coins sold on the market was higher in 1951 than in 1950.

Exports of refined bullion in 1951 were about 7,500,000 oz compared with 4,598,000 oz in 1950.

Domestic Production and Treasury Acquisitions Down

Domestic silver production in 1951 is reliably estimated at 38,750,000 fine oz. This is about 9 percent under the 42,419,129 oz produced in 1950. The decline appears to be due largely to a lower silver content in the base-metal ores, of which silver is a by-product. Although lead production was off somewhat in 1951, the production of both copper and zinc was higher last year than in the preceding year. Lead ores usually carry generous amounts of silver and undoubtedly the lower production of this metal in 1951 accounts for some of the decline in silver production.

Treasury acquisitions of silver in 1951 amounted to 36,235,637.87 fine oz or 93.5 percent of domestic production. This is 12 percent below the 1950 acquisitions of 41,297,599 oz.

Seigniorage Silver Drops

"Free" silver in the General Fund of the Treasury as of December 29, 1951, amounted to 126,970,945 oz as compared with 159,930,638.5 oz on the same date in 1950. (This is the source of the silver from which subsidiary coin is minted.) The decrease of 32,959,693 oz or 21 percent in seigniorage silver is due to increased withdrawals to meet silver-coinage demands during 1951 and sales to armed forces over and above additions to the seigniorage fund made by acquisitions of domestic silver. It should be pointed out that only 30 percent of our domestic production goes into the seigniorage fund, and that 70 percent remains in bullion form against which silver certificates are issued.

Industrial consumption of silver in 1951 is estimated at 110,000,000 oz, about 10,000,000 oz less than in 1950. The fact that imports were down 22 percent with demand on the same high level accounts for the higher commercial price in 1951.

Coinage Leaps Upwards

Coinage demands skyrocketed in 1951 and as a result 44,439,937 fine oz of silver were consumed in the coinage of half dollars, quarters and dimes, over 6,000,000 oz more than the entire year's domestic production. This compares with the 24,598,969 oz consumed in coinage in 1950, an increase of 81 percent. Last year's consumption level was 229 percent over that of 1949. This high rate of new silver coinage will probably continue into 1952, due to the present high level of business activity.

Mexico's coinage programs to satisfy its own needs and those of some foreign countries rose to a high level during 1951. Our southern neighbor has minted a new 5-peso coin, 72 percent of which is pure silver. In addition, a contract with Germany calls for the minting of coins which will consume about 12,500,000 oz of silver and about 18,750,000 oz more are being used in coins for Saudi Arabia.

Silver Circulation Up

Silver dollars and subsidiary silver coins in circulation increased in 1951. By October of last year standard silver dollars in circulation were up $8,000,000 over December, 1950, to a level of $185,000,000, an all-time high. Subsidiary coins in circulation increased from $1.002 billion in December 1950, to $1.072 billion by the end of 1951, an increase of $70,000,000.

Total money in circulation as of December 31, 1951, was $29,196,955,140, compared with $27,740,787,850 on December 30, 1950.

Silver in Congress

A bill (H. R. 1321) to repeal the Silver Purchase Act of 1934 and the Act of July 31, 1946, still remains in the House Ways and Means Committee to which it was referred early in 1951. Our opposition raised its head and growled defiance at the silver purchase laws once or twice during the year but no determined effort to repeal the statutes was detected. The anti-silver faction apparently is having enough troubles of its own at this time securing foreign supplies and perhaps realizes that given the extremely tenuous possibility of repeal of our purchase statutes, with domestic silver subsequently going to commercial channels, the price that users would pay would not be much below the current Treasury price for domestic silver. I am ever watchful of the legislative moves of silverware manufacturers and shall continue to guard the economic welfare of our western silver producers to the utmost of my ability.

Domestic silver output declined as a result of lower lead production

Outlook Brighter

In summarizing the situation, I am of the opinion that the combined pressures of continuing tight supplies and increased industrial demand for silver (including demands for war uses) will force OPS to raise the ceiling price on silver.

I do not believe that the Treasury will be in a position within a year or two to act as a depressing factor on a rising market price since "free" silver in the Treasury's General Fund is being converted into coinage at a rapid rate and the threat of this silver going into commercial channels if the

(*Continued on page* 123)

Despite labor shortage Homestake remained the leading domestic gold producer

GOLD

Long Range Outlook Brighter Despite Decreased World Production and Inflation

By ROBERT W. BACHELOR
Economist
A. M. Kidder Co., New York

WORLD gold production outside the Soviet Union in 1951 apparently declined slightly from the 1950 total, but was about equal to the total of $826,000,000 for 1949, according to preliminary estimates based on reported monthly data. This decline reversed the trend of annual increases in gold production in each of the years 1946-1950. The 1951 production was one-third less than the $1,266 million reported for 1941.

Gold output in the United States probably did not exceed $70,000,000, compared to $80,000,000 in 1950. Mines producing gold as their principal product, suffered reduced earnings as costs rose against a fixed price at the mint.

Scarcities of metals and strategic minerals greatly stimulated a worldwide search for and development of new ore deposits, and the rehabilitation of old properties during 1951, and much gold was produced from these as a by-product. Many mines, abandoned for years, were reopened, not because of a higher price for gold but because of higher prices for other minerals, with the recovery of gold as an additional incentive. The production of most non-ferrous metals was pushed to capacity and a substantial amount of gold was taken out with other metals. Thus we had the paradox of a substantial production of gold coming from countries that did not increase the price of gold in terms of their national currency, and which have not recently devalued their currencies in terms of gold. Countries that granted subsidies to gold mines or permitted gold to be sold for non-monetary purposes at premium prices reported about the same output of gold in 1951 as in 1950. Output of gold in South Africa in 1951 was equal to approximately 80 percent of its prewar output while that marketed by United States operators was only 40 percent of its prewar total. The decline in production in South Africa is due largely to the treatment of lower grade ore, similar to the experience following the devaluations of the 1930s. The decline in output in ounces was more than offset by increased values in pounds sterling.

South Africa and Canada continued to lead the world in the mining of gold and together contributed two-thirds of all production outside of Russia. The United States was third most important, and produced nearly one-tenth of recorded production outside of Russia.

Monetary Stock Shifts

The ownership of monetary gold, as distinguished from production, shifted substantially during the year. The United States steadily lost gold in its international balance of payments, from August 1949 (24,607 million dollars) until May 1951 when its monetary gold stock was reduced to 21,756 million dollars. There was a substantial recovery and inflow of two-thirds of a billion dollars of gold during the latter half of 1951. The year closed with the United States owning about two-thirds of the monetary gold stock of the world outside Russia, and having in its possession 80 percent of monetary gold, including that held under earmark for foreign account.

Redistribution of monetary gold was experienced during the second world war, and is to be expected in a period of rearmament during which large purchases of raw materials are made abroad, together with intergovernmental gifts which build up dollar balances to the credit of foreign countries.

Only about one-third of the newly mined gold of 1951 was used to increase monetary reserves. The remainder was used for industrial and artistic purposes and hoarding. It is impossible to distinguish accurately between these non-monetary uses of

gold since many crudely fabricated articles of gold which take the form of jewelry or works of art may be quickly made available for conversion to monetary forms.

Announce Policy Changes

For each of the years 1949, 1950, and 1951, the United States Treasury has sold to industrial users in the United States, substantially more than the entire mine production of gold in this country.

The 1949 sales exceeded mine production by more than $39,000,000. The estimates of the U. S. Bureau of Mines for 1949 showed gold production of 1,991,783 fine ounces. This would have a value of $69,712,000 as contrasted with net industrial consumption of $108,842,000. An analysis of current Federal Reserve figures on monthly changes in the monetary gold stock of the United States indicates that mint sales of gold in each of the years 1950 and 1951 for industrial uses exceeded domestic production by at least twice the 1949 figure. Thus the United States Treasury, acting as middleman, now forces the mine operators to subsidize the gold fabricators by supplying them with gold at a price substantially below that prevailing in world markets.

At the end of September 1951, the International Monetary Fund announced a change of policy toward the sale of gold for artistic and industrial uses. The Fund expressed the opinion that gold should be concentrated in official reserves, but recognized that there were wide differences in conditions in gold producing and absorbing countries. The Fund announced that it would no longer press for uniform measures to be taken by all members in regulating the sale of gold for non-monetary uses and would leave to its members the practical operating decisions necessary to regulate such sales. The managing director of the Fund observed that the only dependable way to abolish premium gold markets and private hoarding of gold is to create economic conditions under which private demand for gold would be negligible.

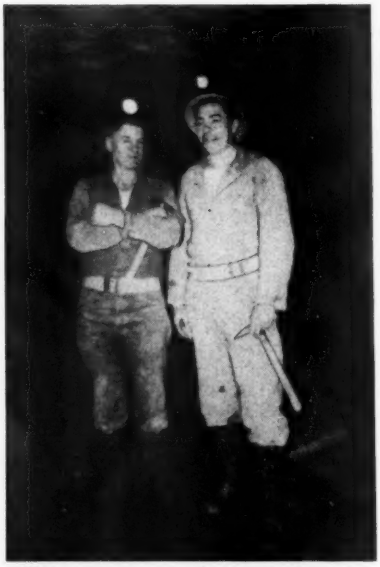
During the closing months of 1951, Canada announced the removal of exchange restrictions, making transfers of funds into or out of the country effective at the market rates of exchange. About this time, sales of Canadian gold in the premium markets were reported at around $39.50 (Canadian) per ounce. Other markets reported prices equivalent to between $39 and $40, United States currency.

Over the past five years, there has been open opposition on the part of the gold producing countries other than the United States to the sale of gold at prices fixed by the International Monetary Fund. Many of the objecting countries adopted various devices such as subsidies or tax benefits to aid the gold mining industry. The mining industry is important to the national economies in maintaining the balance of payments of many countries, and also contributes to employment and governmental revenues by direct and indirect taxes.

In June, 1947, the Fund officially took notice of continued and increasing external purchases and sales of gold at premium prices, and warned its members that such transactions might become sufficiently widespread to disturb exchange relationships. However, it was stated that the Fund would not object to domestic transactions in gold at prices above parity. In December 1947, the Fund issued a statement of policy, which made it clear that the payment of government subsidies to producers of gold would be regarded as an increase in the official buying price for gold.

This conflict between the Fund largely representing United States views and the leading gold producer countries has continued to the present time.

The gold producers have been desirous of securing the greatest possible returns in an unrestricted market, anywhere, and have been unwilling to sell their product at controlled prices when better returns were obtainable from other buyers. The gold producing countries have felt that the terms of trade were being arbitrarily rigged against them, at the instigation of the countries that hold the large stocks of monetary gold. The gold buying countries were desirous of paying as little in terms of their own currency as they could, thus improving their own terms of trade. They did not recognize that their currencies are those generally accepted in international commerce as satisfactory payment anywhere at any time.



With monetary authorities willing to face realities, gold miners may have cause for optimism

Thus, the announcement of change in policy that came at the end of September 1951 was the outgrowth of at least five years of more or less open rebellion on the part of the mine operators and governments of the principal gold exporting countries. The pressure for partial acceptance of the reality of unofficial market quotations became so great that it could no longer be withstood. Some relief for gold producers outside the United States was secured in September, 1949, when there was a general revaluation of world currencies in relation to the United States dollar. It was at that time that the value of the pound sterling was reduced from $4.03 to $2.80, and many other countries substantially revalued their currencies.

Through the entire period from the establishment of the International Monetary Fund to date, an increasing amount of gold has, directly or indirectly, reached the unofficial markets. The rule has been the greater the amount of gold offered, the lower the premium obtainable. This general rule has been upset by wars and rumors of wars. The lowest price of gold in the principal European markets was reached in mid-1950, prior to the Korean action. At that time, the premium did not exceed 10 percent. Since then, the reported price has risen slowly but steadily, and has represented a premium of about 20 percent. Mine operators, who were able to take advantage of the markets for industrial gold, probably have realized a premium of 10 to 12 percent instead of the larger percentages since government regulations seldom permitted more than 40 percent of mine production to reach the premium markets.

Also some quotations represented transactions at which only a small amount of gold changed hands.

Redemption Must Await Peace

The Korean action, begun in 1950, and continued throughout 1951, reminded us of the lesson of history that there can be no currency stability in wartime. The Korean action removed all hope of gold redemption of the United States dollar at a price for gold of $35 per fine ounce.

Gold redemption of the currency must await some future time of peace, when conditions are such that convertibility can be effective, at rates that can be ascertained at that time. Clearly it will be a price substantially higher than $35 per fine ounce. Just

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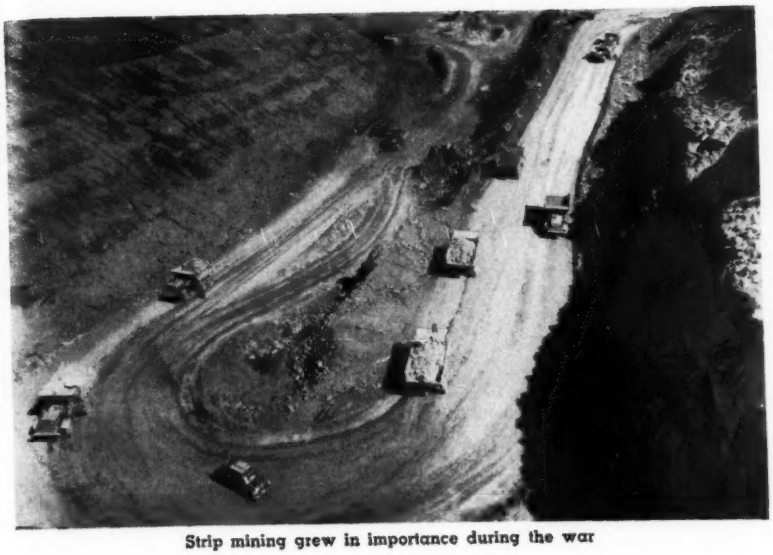


Strip mining grew in importance during the war

Anthracite

Increased Exports Partly Offset Effect of Mild Winter at Home as Research Expansion Plans are Pushed

By EVAN EVANS
President
Lehigh Navigation Coal Co.

The future of anthracite stripping depends largely on the development and use of larger and better equipment such as this experimental 50-ton capacity, diesel powered truck

COMMERCIAL production of anthracite in 1951 dropped to 39,500,000 net tons (estimated), a reduction of 6.6 percent as compared with 42,315,000 net tons produced in 1950. This is the first time since the 1930's that output fell below 40,000,000 tons.

While there were no major strikes or work stoppages during 1951, several factors seriously affected the year's output. Another unseasonably mild winter, the third in succession of the warmest winters ever known in the 70-year history of the New York weather bureau, was largely responsible for the drop in tonnage. Up to mid-February, temperatures had been closer to normal than in the previous two years. An abnormally warm spell just after mid-February took over for the balance of the heating season and the number of degree days decreased from 1584 in 1950 to 1249 in 1951. Early fall was warm but November was sufficiently colder than in 1950 to result in a substantial upturn in consumption. December was marked by both record-breaking warm days and severely cold weather, including two heavy snow storms.

Operating time in terms of the weighted average of days worked was 207 days, as compared with 215 days in 1950. Total men employed in the industry declined to 64,800; this is 5000 less than the year before.

Exports to Europe exceeded 2,000,000 tons, of which 50 percent was pea and larger, substantially more than in 1950. It is believed that exports to the European market will continue at the present high level due to the increased demand in the countries of Western Europe and their inability to meet their own needs. Anthracite made gains in the Canadian market during the 1950-51 coal year. Reports furnished by United States shippers and Canadian wholesalers indicated an increase of 4.5 percent.

Employe relations were stable during the year and the contract between the operators and the United Mine Workers union continued in force. Output per man day, particularly in underground production showed another slight decline and continues to be a problem of serious concern to most producers.

Natural gas made new inroads in the primary territory where anthracite is sold. Oil, bituminous and other rival fuels were in plentiful supply intensifying the highly competitive picture in the domestic fuel market. New housing construction was somewhat more active than expected, with beneficial effect. The expanding market for the smaller sizes of anthracite for industrial purposes was a notable development during the year.

Progressive Spirit Shown

The industry displayed a more progressive spirit in meeting its complex problems. In the Spring of 1951 anthracite entered the new field of television with its "Better Home Show" over eleven leading television outlets throughout the east. Inten-

sive newspaper and trade journal advertising was continued. In cooperation with equipment manufacturers, automatic anthracite burning equipment was displayed at 30 different exhibits at home shows in seven states and Canada.

New improvements in mining and preparation methods were reported by the industry and various research organizations. Considerable work on gasification was accomplished. Studies were made on the sampling precision required at fine coal cleaning plants and several plant tests were made to check the results. A survey was made of screening, dewatering and drying equipment used by the industry for the preparation of fine sizes. An investigation was also made of several different methods for rapid control tests of moisture and ash.

Intensified research toward improved automatic burning equipment was successful and sales were an estimated 13 percent over 1950.

In spite of urgent pleas from industry and government, the public failed to stock up on anthracite during the warm weather months in order to avert or minimize anticipated difficulties in transportation and supply during the winter. This reaction reflected the general apathy throughout the country brought about by peace talks in Korea and the consequent sense of ready availability of most commodities.

Deep Production Down

Anthracite underground production showed a slight percentage decline in comparison with the previous year. Statistics compiled by the Anthracite Committee indicate that 63.5 percent of the year's output came from deep mines as compared with 64.6 percent in 1950. Underground production per producing employe showed a reduction for the second successive year, being 4.19 tons as compared with 4.21 in 1950 and 4.27 in 1949.

One of the new haulage units being tested is powered by a 550 hp engine, using propane as fuel

This trend toward lower underground production was one of the most perplexing problems confronting anthracite operators in 1951. The depletion of most of the banks and the fact that strippings output can be attained only from deeper, more expensive surface jobs, combined to emphasize the need for increased mine output.

Challenged to increase output per man day underground, the industry must find the answer in improved mining methods and a wider use of mechanized equipment.

In this connection, the Anthracite Research Laboratory of the U. S. Bureau of Mines at Schuylkill Haven, Pa., had among its active projects the field testing of mining equipment and mining methods. The laboratory has instituted a broad program of testwork on the Korfmann Universal shearing machine, Model SK2O, imported from Germany; the Eichoff Model DEK shearing machine, also imported from Germany, and the German-made Brieden pneumatic packing machine. Underground experimental work with lightweight shearing machines in pitching anthracite beds, the use of the Korfmann Universal shearing machine for driving pillar roads in thick beds, and longhole retreat mining of a steeply pitching anthracite bed, are three typical field tests in progress. With machines in actual field operation, the research laboratory is seeking to improve the design of these foreign-manufactured devices to determine if they can be adapted to the conditions of Pennsylvania anthracite mines.

Numerous Projects Studied

Laboratory projects included investigations of gangway development, present methods of mining steeply pitching thin coal seams, mechanized mining in the thin seams on heavy pitch, investigation of the design and

ANTHRACITE PRODUCTION[1]

Year	Commercial Production, All Sizes (Millions of Tons)	Total Men Employed (Thousands)	Daily Production (Thousands of Tons)	Weighted Average Days Worked	Lb Colliery Fuel Per Ton of Production	Percent Pea and Larger	Percent Buck Rice Barley	Percent No. 4 and Smaller	Percent from Underground	Percent from Stripping and Bank	Underground Production Per Producing Employe Per Day	Production Per Total Employe Per Day	Commercial Production Barley and Larger Per Total Employe Per Day
1924	...	...	...	...	...	73.0	25.7	1.3	...	...	...	...	...
1939	48.3	92.6	264	183	100	...	...	...	83.9	16.1	...	...	...
1940	48.2	90.8	259	186	93	64.1	32.4	3.5	81.7	18.3	...	...	...
1941	52.6	87.5	259	203	86	62.9	33.2	3.9	79.8	20.2	4.69	2.65	...
1942	56.6	81.6	231	245.1	83	62.4	33.0	4.6	76.3	23.7	4.51	2.55	...
1943	56.8	78.6	206	275.4	83	61.2	33.4	5.4	71.7	28.3	4.37	2.42	...
1944	59.9	77.0	199	300.6	74	60.8	33.7	5.5	66.6	33.4	4.41	2.45	...
1945	51.4	72.2	188	273.0	79	60.4	32.6	7.0	64.6	35.4	4.38	2.37	...
1946	57.3	77.4	207	277.2	66	59.9	31.5	8.6	63.8	36.2	4.40	2.44	...
1947	54.0	74.6	196	270.8	65	58.8	31.0	10.2	65.67	34.33	4.32	2.39	...
1948	54.0	75.8	202	267.0	65	59.2	30.7	10.1	65.8	34.2	4.26	2.39	...
1949	40.5	72.0	206	196.7	47.4	58.1	30.8	11.1	64.4	35.6	4.27	2.52	...
1950	42.15	69.8	196	214.9	44	59.2	30.9	9.9	64.6	35.4	4.21	2.81	...
1951 (Estimate)	39.5	64.8	190	207	42[2]	56.5[2]	31.4[2]	12.1	63.5	36.5	4.19	2.95	2.52[3]

[1] Source of information—Anthracite Production Control Committee.
[2] Ten months' average.
[3] Added to eliminate the distortion caused by the large amount of No. 4 and smaller that is recovered from silt beds when the demand for small sizes is heavy.

operation of electrically controlled mechanisms in underground pumping plants, preliminary design and manufacture of a vibrating coal planer, performance of a 20-hp Korfmann shearing machine in a steeply pitching anthracite bed, redesign, reconstruction and electrification of the USBM scraper shaker loader, mechanization of gangway and heading development work in a steeply pitching anthracite mine, and mechanization of thick bed pillars. It is hoped that the Bureau's own designs of equipment plus improvements on certain European machines, may result in increased safety, lower production costs, a higher recovery ratio, and a better quality product.

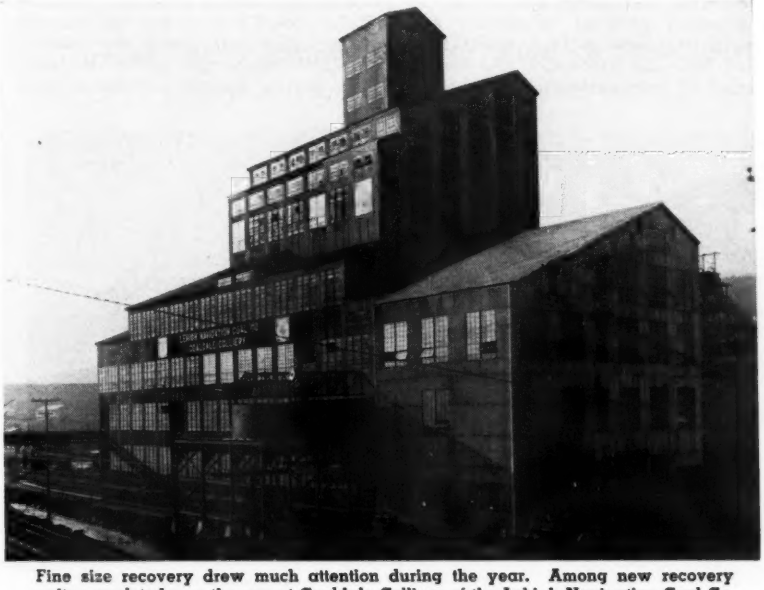
Another active project seeks to determine the loads borne by roadway supports as the basis for design of a tunnel shield for driving gangways in pitching coal beds. Electric load cells have been designed, built and calibrated, and a continuous recording instrument provided to measure the magnitude and rate of change of roof loads.

Experiments were completed using long drill holes in a 10-ft bed pitching 82 deg. This longhole retreat mining is being done in a section 270 ft long and 70 ft high. Research on a permanent type lightweight concrete roof support for underground haulageways is advancing. Efforts have been concentrated on the design of a lightweight concrete lining for use in haulageways where scaling of the roof and walls is the chief concern, and where loads of 5000 to 10,000 lb are anticipated.

A project to design a large-capacity underground compressed air receiver excavated in solid coal is also receiving attention. The idea is not new, but is spurred by poor performance of compressed air tools due to low pressures and insufficient air, the result of extended supply lines. An accurate engineering analysis of the entire compressed air system has been made to determine the advantages of such a receiver.

Packing Machine Developed

Pneumatic packing, long widely practiced abroad, is being tried here. Continued successful use of the Brieden pneumatic rock stowing machine prompted the Glen Alden Coal Co. to order a smaller machine of the same general type for use in pack-filling over permanent timbering and arches. This new machine has been delivered, and will shortly be put into service. Testing the Brieden machine is expected to show whether pneumatic pack filling will permit maintaining a high production rate for mining thick bed pillars safely.



Fine size recovery drew much attention during the year. Among new recovery units completed was the one at Coaldale Colliery of the Lehigh Navigation Coal Co.

Flood Control Project Curtailed

Investigation of mine flood control and pumping problems in the anthracite region under way since mid-1944 was drastically curtailed in 1951 due to the failure of Congress to appropriate sufficient funds. Field offices established since 1948 in Scranton, Hazleton and Pottsville, Pa., had to be closed.

A study is being made of surface streams to determine methods to decrease infiltration of surface water into the underground mine workings and thus lessen the amount of water that has to be handled by drainage tunnels or pumps. To date, 71 streams have been examined in the Northern field. Since the inundation of anthracite mines is a continuing threat to the life of the anthracite industry, to efficient production and to the economic well-being of many thousands of people, it is regrettable that the work of the Anthracite Flood-Prevention Section cannot be carried on.

Stripping Operations Active

Production obtained from strippings and banks added up to a larger percentage of the industry's output than in any previous year, being 36.5 percent of the total. This source is increasingly important since output is generally obtained at a cost lower than by underground mining. In light of the growing expense for underground labor and the trend to lower per man output, many operators must look to low cost strippings to offset excessive deep mine costs.

The stripping industry in the anthracite area has progressed during the last ten years principally because of better equipment and better application to meet the problems presented. The ratio of overburden removed economically per ton of marketable coal has increased at least 50 percent during this period. If stripping is to continue to hold its place in the anthracite area, additional efforts must entail the use of still better equipment. At present, there are very few so-called outcrop strippings with small equipment in existence. Strippings in general are in one of two classes: one, where large draglines from 8- to 25-cu yd capacity can be used successfully to remove overburden; and two, by large operations where overburden must be handled by loading shovels and trucks.

Notable advances were made in hauling and loading and some in drilling. In the loading phase, two manufacturers have developed new shovels. Neither of these is working in the anthracite region at present, but at least one of each has been ordered by contractors for use as soon as deliveries can be made. In the hauling phase, two 50-ton units were placed on trial during 1951. One has a rated hauling capacity of 50 tons. This truck is of the three-axle type and is powered by twin, 300 hp diesel engines. The other unit also has a rated load carrying capacity of 50 tons but is powered by a 550 hp engine using propane as a fuel. This unit is a departure from the standard rigid frame truck and its progress in the anthracite field will be followed with interest. In the drilling phase, a Rotary type drill was put into operation near the close of the year. A radical departure from the customary

churn and percussion type drills, it is too soon to predict its future in the anthracite area. Here most of the drilling is in sandstone, and may seriously limit bit life. However, this drill has been used with considerable success in bituminous coal and limestone operations.

Future of anthracite stripping operations depends largely on the following:

(1) A careful evaluation of the coal property to recognize, develop, and preserve potential stripping areas.

(2) Application of correct engineering principles to development and operation of strippings.

(3) Development and use of larger and better equipment for operating economy.

Rail Rates Increased

In March, the railroads petitioned the Interstate Commerce Commission for general increases which, in the case of anthracite, were scaled up to a maximum of 50 cents per net ton. After extensive hearings, the Commission permitted increases of six percent with a maximum of 20 cents per net ton. Late in the fall, the railroads asked the Commission to reopen and reconsider the case and grant the full increases originally requested. The Commission set January 14 for reopening the railroads' request.

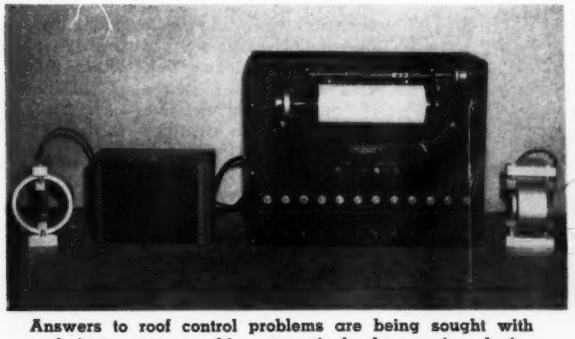
After a series of negotiations following the proposals of the railroads to increase rates on raw coal and condemned anthracite by five cents per gross ton, the carriers finally published tariffs increasing the rate by three cents per gross ton, effective December 17.

Cooperate in Research Work

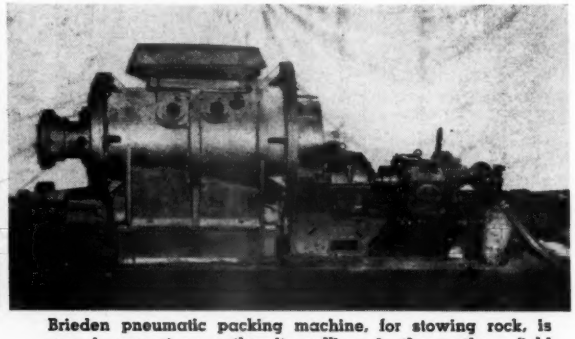
Research and engineering work during 1951 was divided into basic research, equipment development and equipment testing. Anthracite Institute, the Anthracite Research Laboratory of the U. S. Bureau of Mines, Pennsylvania State College, and various other research groups carried out cooperative technical projects.

A number of basic studies were started during the year including work on the use of anthracite and anthracite ash as a filter aid in the chemical industry. In the field of equipment development, encouraging results were obtained with the new commercial crossfeed stokers. A new type furnace for heating small homes was built. It eliminates all indoor handling of coal or ash. A low-cost tobacco curing furnace received its first field trials during the curing season in Ontario and North Carolina.

Engineering cooperation with manufacturers was continued in the approval testing program. A total of 29 projects resulted in seven new pieces of equipment being added to the approved list. The jointly supported anthracite research of the Commonwealth of Pennsylvania and Anthracite Institute was continued in the School of Mineral Industries of Pennsylvania State College. Investigations included the following problems: combustion of anthracite, gasification of anthracite, physical properties and special uses, anthracite as a metallurgical fuel, and utilization and beneficiation of anthracite fines.



Answers to roof control problems are being sought with such instruments as this automatic load-measuring device



Brieden pneumatic packing machine, for stowing rock, is now in use at an anthracite colliery in the northern field

New Equipment Installed

The Lehigh Navigation Coal Co. completed an addition for fine size recovery to its Coaldale Colliery at a cost of over $500,000. New fine coal (froth flotation) plants were constructed at six locations in Pennsylvania. A Wilmot stove coal hydrotator was put into operation at the Sun Valley Coal Co., Tomhicken, Pa. In one case, tests are now being completed for the purpose of making up a complete flow sheet. At this operation a refuse bed dating back at least 60 years is yielding No. 4 Buckwheat, No. 5 Buckwheat, Rice and Barley at the rate of 100 tph, with 50 percent of this being No. 5.

A new method of preparing anthracite—the Roller Heavy Density Process—is to be installed in the Coal Rain Coal Co. at Junedale by H. J. Daniels and Co., Inc. The new process, it is claimed, makes a perfect separation of coal and refuse in a bath consisting of water and finely-powdered magnetic iron ore. The principle of iron ore separation in itself is not new. The Roller Process, however, is said to be an advanced application of the principle. The operator can control specific gravity easily without numerous complicated and costly controls. It is claimed that the process eliminates completely the condemning of cars of prepared coal because of high ash analysis.

Clean Streams Program

Anthracite operators continue to cooperate with the work of the State Sanitary Water Board which is aimed at controlling the silt in breaker water discharges into streams. Of the 183 establishments now engaged in the preparation of anthracite by wet process, 159 have completed and placed in operation adequate facilities for the retention of waste solids and 19 have works under construction. Since the beginning of 1946, when the Sanitary Water Board's program had already effected some reduction in the quantity of solids discharged to the streams, the quantity has been reduced from 19,000 tons per day to less than 2000 tons over the entire anthracite region. At present 28,000 tons per day of silt are being retained by the collieries.

The streams which were first relieved of the burden of coal silt, namely Swatara Creek and the Schuylkill River, are now cleaning themselves out with every successive occasion of high water. Beds of these streams, which were formerly entirely black with the silt deposits of many years, are now, in the upper portions, turning to the natural color of sand and gravel.

With possibly one exception, 1951 saw the completion and placing in operation of desilting facilities at all of the anthracite collieries. By 1952, the total silt reaching all of the streams in the anthracite region from active colliery operations will probably be not over a few thousand tons per year of very fine material and may be considerably less.

(*Continued on page* 118)

Iron and Steel Scrap

Unassorted Iron and Steel scrap for foundry use

—Iron & Steel Inst. photo

Ferrous Scrap Supply Fell Far Short of Safe Level Despite Record Breaking Turnover

By JAMES E. LARKIN
Commodity Specialist
United States Bureau of Mines

FERROUS scrap consumption in the United States during 1951 was the largest in the history of the industry and is estimated to have reached 69,000,000 gross tons. Of this total, 34,000,000 gross tons was purchased scrap, an all-time record high. This figure includes consumption of 3,100,622 gross tons during March, the greatest amount ever used in one month, and more than 3,000,000 tons per month during January, April and May; each of these three months exceeded the previous record month—October 1950. Purchased scrap used during the year exceeded that used in 1950, a partial peacetime year, by 5,000,000 gross tons; in 1948, the highest peacetime year, by 5,000,000 tons; and in 1942, the highest year, by 10,000,000 tons. Increased use of purchased scrap resulted in more home scrap being regenerated and established a record year, by the use of 35,000,000 gross tons of this type scrap. Consumption during March was the highest for any one in the year, exceeding use figures for May and October, which were also greater than the previous record month of October 1950. Home scrap was greater than in 1950 by 3,000,000 tons than in 1948, the highest peacetime year, by 6,000,000 tons, and 1944, the highest war year, by 3,000,000 tons.

The large use of ferrous scrap caused a greater demand for pig iron; accordingly, a record year was established by the consumption of 64,000,000 gross tons. Consumption of pig iron during October (5,601,392 gross tons) was the greatest amount used in any one month. Pig-iron consumption during the year exceeded 1950 needs by 6,000,000 gross tons, 1948 by 10,000,000 tons and 1944, by 10,000,000 tons.

Consumption of ferrous materials (scrap and pig iron) during the first 10 months of 1951 by all users totaled 110,628,905 gross tons. This total was made up, in part, by the record setting months of: January (11,342,508 gross tons); March (11,593,204 gross tons); May (11,618,209 gross tons); and October (11,470,982 gross tons). It is estimated that during the last two months of the year, utilization of ferrous materials amounted to 22,200,000 gross tons, making a total consumption for the year of 133,000,000 gross tons. This will be the greatest consumption of these materials in the history of the industry and will exceed 1950 uses by 13,000,000 tons; 1948, by 21,000,000 tons; and 1944, by 24,000,000 tons. The total melt for 1951 comprised 34,000,000 tons of purchased scrap, 35,000,000 tons of home scrap, and 64,000,000 tons of pig iron. The percentage of materials used in the total melt were 26 percent purchased scrap, 26 percent home scrap (for a total of 52 percent scrap) and 48 percent pig iron.

Stocks Dangerously Low

With war in Korea and record continuing demands for steel products in the United States, it was apparent that steel makers would have to produce more steel during 1951 than in 1950 and thereby establish a new high. They were called upon early in the year to expand their production facilities to a great enough capacity to meet the requirements of an increased

Consumption of Iron and Steel Scrap and Pig Iron
January through December 1951, in Gross Tons

Month	Purchased	Home	Total	Pig Iron
January	3,010,300	2,965,082	5,975,382	5,367,126
February	2,691,692	2,645,870	5,337,562	4,725,231
March	3,100,622	3,086,898	6,187,520	5,405,684
April	3,013,527	2,974,420	5,987,947	5,280,648
May	3,087,313	3,009,365	6,096,678	5,521,531
June	2,847,856	2,845,546	5,693,402	5,347,572
July	2,581,856	2,716,788	5,298,644	5,316,792
August	2,721,287	2,893,248	5,614,535	5,358,256
September	2,585,665	2,791,826	5,377,491	5,265,922
October	2,826,221	3,043,369	5,869,590	5,601,392
November*	2,700,000	2,800,000	5,500,000	5,300,000
December*	2,900,000	3,000,000	5,900,000	5,500,000
TOTAL	34,066,339	34,772,412	68,838,751	63,990,154

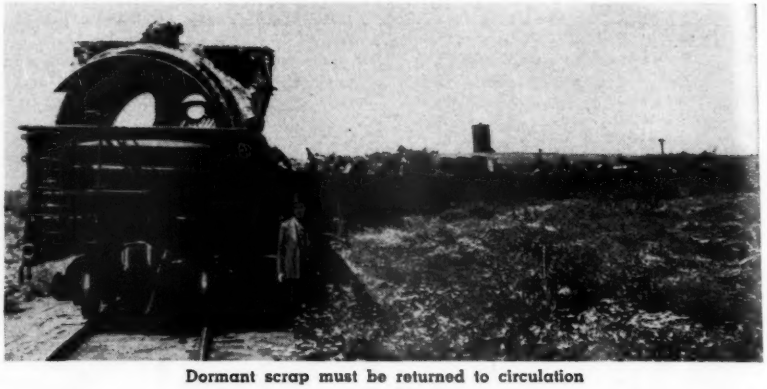
* Estimated

military program as well as domestic needs. To accomplish this task, it came to the attention of the Government and industry that more market or purchased scrap would have to be received by the mills, particularly since consumers' stocks of purchased scrap had dropped from 3,683,349 gross tons at the end of January to a low during the year of 2,626,308 gross tons at the end of June, equivalent to a 27-day supply based on the consumption rate of purchased scrap for that month. This meant that if the total consumption of purchased scrap continued at more than 2,800,000 gross tons (the average for the first 10 months of the year) stocks would continue at less than a 30-day supply for the entire iron and steel industry unless new sources of scrap were made available. The same problem confronted the Nation during World War II, but it was overcome by the concerted efforts of the iron and steel scrap dealers, automobile wreckers, manufacturers, and railroads, as well as by Government scrap drives to bring out all obsolete scrap from homes and farms. These drives and the extra effort put forth by the above-mentioned sources of scrap soon raised the level of purchased scrap held by consumers to a 60-day supply, a reasonably safe margin on which to operate.

Scrap Drives Pay Off

In the present emergency the Government, through the National Production Authority, organized committees in industry to appoint representatives in their organizations to urge the collection of all dormant plant scrap and to identify machinery that was obsolete and could be scrapped. Government agencies, including the Navy, Army, Maritime Commission, Interior, and Agriculture, were called upon to urge their various installations, yards, mines, and experimental stations to bring out all possible scrap. Results of this combined effort on the part of the scrap, iron and steel industries and Government agencies to bring out as much scrap as possible were evident by the end of October, when the stocks of purchased scrap held by consumers had advanced to a 32-day supply. This advance over June, in stocks of purchased scrap, was the result of various scrap drives. If these drives continue to be as successful as were those in the past, purchased-scrap stocks held by consumers should reach a safe margin by the end of the year.

During the year automobile wreckers came to the fore as a source of scrap. It was estimated that a potential of 3,000,000-5,000,000 tons of scrap in the form of wrecked automobile bodies that had been stripped of all usable parts could be made available to steel mills and foundries. The wreckers had not considered it economically feasible to ship wrecked automobile bodies, but the Bethlehem Steel Co. inaugurated a system of going to the auto graveyards to compress the bodies to a thickness of one ft by dropping a two-ton armor plate from a 30-ft crane boom. About a dozen of these mashed cars can be loaded on a trailer, where before this process less than six could be carried.



Dormant scrap must be returned to circulation

Controls Felt Necessary

Regardless of efforts put forth during the year to bring out more scrap, it was felt that some means of control over stocks and prices would be necessary. It appeared that this could best be accomplished by Government with the aid of industry. A Scrap Section, organized under NPA to control stocks, began to function in February under Order M-20, amended. The section could order increases or decreases in consumers' steel-scrap inventories and allocate scrap and specifically direct the manner and quantities of delivery. The order, however, did not change the 60-day limit on dealer and broker inventories nor mills' practical working minimum. March marked the beginning of allocations of scrap from dealers to consumers. Control over automobile wreckers was not exercised until December 11, when NPA issued Order M-92, requiring an inventory report from automobile wreckers by December 20, covering the number of motor vehicles and car units and the poundage of loose scrap. The new order limited acceptance by automobile wreckers of delivery of motor vehicles or car units and requires quarterly turnover of motor vehicles manufactured before 1946. It also requires automobile wreckers to comply with NPA allocation directives at any time.

On January 2, 1951, the price of No. 1 Heavy Melting scrap at Pittsburgh was $46.13 compared with $29.75 per gross ton at the same time for the previous year. By the end of January the price had advanced to $51.13 compared with $31.25 at the end of January 1950. This price prevailed until February 7, when it was rolled back to $44.00 per ton by the Office of Price Stabilization, a level $24.00 per ton over the ceiling placed on No. 1 Heavy Melting and Cast scrap by the Office of Price Administration during World War II. The price of Cast scrap on January 2, 1951 was quoted at $67.75, compared with $37.50 at the same time in 1950. At the same time that other prices of scrap were rolled back, a ceiling of $49.00 per ton was placed on cast iron scrap.

—Iron & Steel Inst. photo

Pig Iron (left) and scrap, (right) are basic raw materials for steel-making

Nonferrous Scrap Metals

Rearmament Plus Civilian Needs Created Abnormal Demand While Recovery was Off

By ARCHIE J. McDERMID
Commodity Specialist
United States Bureau of Mines

HIGH level of industry throughout 1951 resulted in the generation of a large volume of scrap metals—new scrap as the byproduct of metal-working processes and old scrap from equipment worn out or become obsolete. Consumption of metals was so high that the output of metals from scrap and primary raw materials was inadequate to satisfy all wants, making necessary Government regulation of materials in short supply.

Preparedness requirements superimposed on large civilian needs were responsible for those abnormal demands. The attempt to evaluate all these requirements presented the National Production Authority, the Office of Price Stabilization, and other agencies with complex and difficult problems. Government control of materials in short supply, including secondary metals, instituted in 1950 had an increasing effect in 1951 as restrictions on uses were tightened and price ceilings imposed.

Anticipation of price ceilings lower than current quotations accelerated the flow of nonferrous scrap metals in the early months of 1951, as sellers depleted their inventories. The establishment of ceiling prices on aluminum, copper, lead and zinc scrap by OPS in June was followed by notable decreases in the recorded flow of these materials from scrap generators and dealers to consumers. It was expected that dealers' scrap inventories would be replenished in about two months, but the flow of scrap to consumers did not increase as anticipated. Receipts and consumption of aluminum, copper, lead, and zinc scrap were much smaller in the latter half of 1951 than in the first.

Numerous reasons were given by various authorities in the industry for reduced supplies of scrap at smelters, refineries, and rolling mills. Accumulation of large stocks by dealers and generators; buying of scrap instead of ingots by brass foundries; hoarding of scrap by speculators; application of domestic ceiling prices to imports of lead and zinc scrap; and the absence of ceilings on copper-scrap transactions between dealers were all blamed. Near the end of the year the industry suggested that, in general, scrap should not be purchased directly by the consumer from the generator but should pass through the hands of dealers for cleaning, segregation, and apportioning and that purchases of copper scrap by foundries and aluminum scrap by primary producers should be limited.

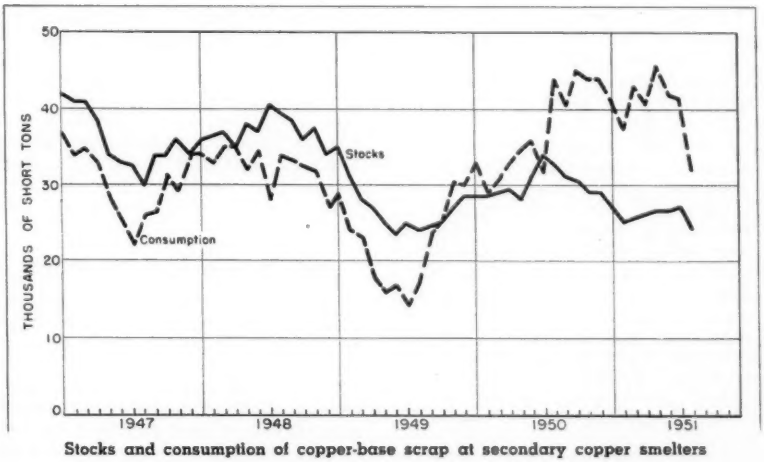
Copper, lead, and zinc scrap needs were regarded as more urgent than needs for aluminum and magnesium scrap because the supply of primary raw materials for production of the light metals was more nearly adequate. Furthermore, production of aluminum and magnesium was soon to be greatly increased by the building of more extraction facilities, whereas increased primary output of the base metals depended more upon the necessarily slow development and equipment of new mines and mills. Recovery of secondary aluminum and magnesium cannot overtake maximum primary production capacity, at least in the foreseeable future. Production of copper and lead from scrap in recent years has been greater than domestic mine production of those metals, which emphasizes the importance of copper and lead scrap statistics.

The graph (Fig. 1) shows the decreasing availability of copper scrap at secondary smelters. In the middle of 1949, when the market was dull, stocks exceeded monthly consumption by about 10,000 short tons. As smelting operations increased, the scrap stocks declined relative to consumption, and in 1951 were considerably less than the monthly consumption or 30 days' supply.

Use Up—Recovery Down

Total recovery of secondary copper in 1951, as unalloyed metal and in combination with other metals and elements, was estimated to be about 960,000 tons, two percent less than in 1950, when the total was 977,239 tons. Recovery in the first half of 1951 matched that of the preceding six months, but recovery in the last six months of 1951 did not equal that in the first half of 1950.

Brass-ingot makers produced about 355,000 tons of ingot in 1951 compared with 340,687 tons in 1950, and the brass mills' recovery of metal from copper-base scrap was expected to be about the same as in 1950, when it totaled 418,571 tons. In 1951, the foundries, which customarily use virtually all of the brass ingot produced, were unable to obtain enough ingot and hence increased their use of copper scrap to an estimated 240,000 tons. Like the other consumers, they would have been glad to get more. Their recovery of copper from scrap was about 190,000 tons. Primary copper producers were affected more than any other group by the scrap scarcity in 1951. Being limited to a ceiling of 24.5 cents a lb in the sale of their refined copper, they found it difficult to compete for scrap with the other groups whose products were more flexibly priced. Production of refined copper from scrap in 1951 was estimated at 130,000 tons compared with 189,746 tons in 1950.



Stocks and consumption of copper-base scrap at secondary copper smelters

Aluminum from Plant Scrap

In past years, the chief source of old aluminum scrap was wrecked and obsolete military airplanes. Relatively few of these planes were available for salvage in 1951, so most of the secondary aluminum was recovered from plant scrap. Recovery in 1951 was estimated to total 257,000 tons, of which the share of the ingot makers, also known as secondary aluminum smelters, was estimated at 161,000 tons, that of the primary aluminum producers (Alcoa, Reynolds and Kaiser), at 80,000 tons, and that of the foundries at 16,000 tons. This compared with 165,352, 64,667, and 13,647 tons, respectively, in 1950. The primary producers fared better than the secondary smelters in the competition for scrap, probably because of the tendency of fabricators to sell their plant scrap back to the producers from whom they purchased their sheet or ingot. In the allocations of raw materials for the final quarter of 1951, purchases of scrap by primary producers were limited, but this was not expected to have much effect on their recovery of secondary metal before 1952. The reported increase in recovery by the foundries is due in part to more complete coverage following introduction of mandatory reporting, as prescribed by NPA in Order M-22.

Foundries used a much smaller proportion of the total aluminum scrap consumed than they did of the total copper scrap treated. Aluminum alloys have about the same appearance, no matter what their composition, whereas an experienced sorter can state quite accurately the composition of a sample of brass or bronze after inspecting a fresh surface. Determination of the composition of an aluminum alloy thus requires laboratory analysis, not always feasible for a foundry. For this reason it is usually more economical for a foundry to buy aluminum ingot of specified composition than scrap of undetermined composition.

Lead Recovery Up

Although consumption of lead scrap decreased following establishment of ceiling prices, the decline was not as severe as in the case of copper scrap. Monthly consumption of lead-base scrap in the first eight months of 1951 ranged from 51,900 tons in August to 61,847 tons in March compared with a range of 39,384 tons to 44,293 in the first eight months of 1950.

Total reported secondary recovery of lead was expected to approximate 500,000 tons, or four percent more than in 1950, when 482,275 tons were reclaimed. Part of the increase was attributable to the addition of new respondents to the list covered by the survey. Reporting on the Bureau of Mines lead-scrap form was made mandatory for secondary lead smelters by the issuance on February 16 of Order M-38 by NPA. In 1951 secondary lead recovery exceeded domestic mine production for the sixth successive year.

Zinc Scrap Scarce

In 1951 an estimated 286,000 tons of zinc was reclaimed from nonferrous scrap metal. It was obtained chiefly from copper and zinc scrap, but a few hundred tons was recovered from aluminum scrap. Three-fourths of the total recovered came from new scrap. Zinc recovered from brass scrap in 1951 was a little less than in 1950, when it totaled 158,228 tons, because a smaller quantity of brass scrap used in making copper products was available than in 1950. This zinc, although recorded as recovered, was not in most instances separated from the other constituents of the brass scrap but remained in alloy form, the product as well as the scrap having the composition of brass or bronze.

Four-fifths of the zinc scrap consumed was new scrap, i.e., plant scrap or byproduct residues. So much zinc is used in products such as galvanized articles, paints and pigments, from which zinc cannot practically be recovered, that old zinc scrap is relatively unimportant. Most of the zinc residues, including dross, dry skimmings and sal skimmings are byproducts of galvanizing operations. As less zinc was used for galvanizing in 1951 than in 1950, less residues were available for the secondary plants to use. The zinc-byproducts residues, except dross which is metallic in form, contain large percentages of zinc oxide, chloride, and carbonate, which are readily converted to commercial-grade chemicals without smelting. Sal skimmings were much in demand for the manufacture of zinc chloride, used in treating timber, in dry-cell batteries, etc., and for making zinc ammonium chloride, important as a flux in galvanizing. This illustrates the scarcity of zinc in 1951. In 1950 and previous years, generators found it difficult to sell sal skimmings.

Anthracite

(*Continued from page* 114)

Bootleggers Still Active

So-called "bootleg" anthracite production is estimated by the Anthracite Committee to have been just under 2,100,000 tons in 1951, as compared with 2,125,753 tons in 1950. This outlaw production does not include any tonnage from "independent" operators who, though they may be nonunion, have lease arrangements with land owners or with counties and pay taxes, etc.

Safety Work Forwarded

The fatality rate per million manhours for the anthracite region for 11 months of 1951 was 0.82, as compared with 0.67 for the full year of 1950, and 0.80 in 1949. These statistics are provided by the Pennsylvania Department of Mines, which carried out its activities in the interests of mine safety, first aid training and mine rescue training during the year.

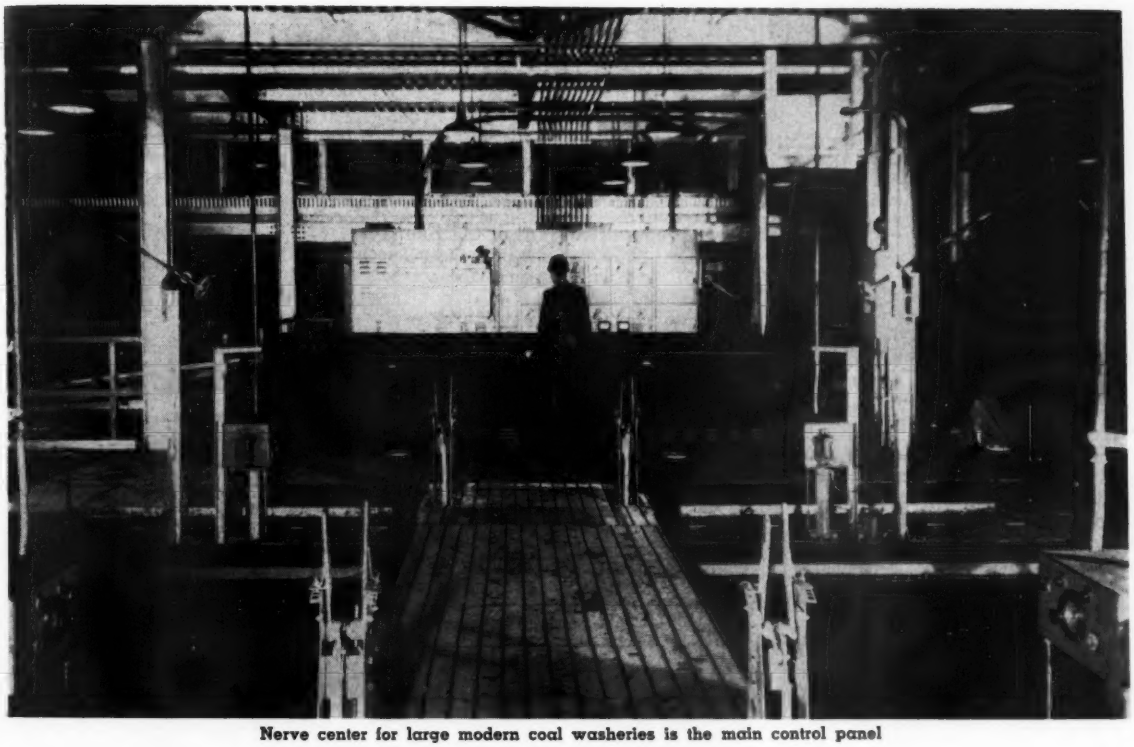
The Wilkes-Barre Branch, Safety and Coal Mine Inspection Division, U. S. Bureau of Mines, did notable work in advancing an accident prevention course for miners, which took it into all three anthracite districts. This training program had the wholehearted cooperation of operators and the UMW.

Most large-producing companies encouraged interest in first aid and accident prevention, by staging contests in their respective areas. An industry-wide meet was held at Irem Temple Country Club, Wilkes-Barre, on September 8, with the Hazleton Shaft team of Lehigh Valley Coal Co. emerging as the championship squad in closely contested competition. A signal honor was annexed by the anthracite industry in the "Olympic Games" of mining—the National First Aid and Mine Rescue Contest at Columbus, Ohio, October 2-4, when the Maple Hill Colliery team of the Philadelphia and Reading Coal and Iron Co. swept national championship laurels in competition with 70 other crack first aid teams.

Anthracite Ready for Role in Preparedness Effort

After three years of abnormally warm weather, the anthracite industry looks for a return to normally cold temperatures and a corresponding lift in production in 1952. Active promotion of anthracite through a cooperative program of television, newspaper and radio advertising, the expansion of the staff of field workers, and the continued high interest in automatic anthracite burning equipment, are reminders that the industry is alert to its problems and is working hard to improve its position in a highly competitive situation.

Thus far, the national defense program which picked up speed after the outbreak of war in Korea has had little material effect on anthracite. The industry has been hampered by rising costs and the short supply of certain materials vital to mining operations. Anthracite stands ready and willing to take a more active role in the United States preparedness effort.



Nerve center for large modern coal washeries is the main control panel

Modern Trends in Coal Preparation

Proper Planning Will Permit Small and Medium Mines to Prepare Coal Mechanically and Cheaply

By CAREL ROBINSON
and
LEE R. SMITH
Robinson and Robinson,
Charleston, W. Va.

THE year 1951 has seen several remarkable innovations in preparation of coal in the United States.

Cleaning of fine sizes of coal, both by wet and dry methods, during this period, has continued to increase. Use of heavy media washers for cleaning plus ¼-in. coal has shown a definite gain.

In discussing trends in the art of coal preparation during the past year, each method is considered under a separate heading.

Baum Washer Leads Again

This type washer has continued to lead the field in total tons of coal cleaned per hour, especially in the coarse sizes. However a number of plants have been installed or are being installed in which this jig is used to clean both coarse and fine sizes of coal in the same washbox. A number of improvements have been made in this washer. One manufacturer has reduced by half the quantity of circulating water required. There has, also, been a definite tendency to increase the number of compartments and cells in this washer.

Hydrotator Cleaning Unit

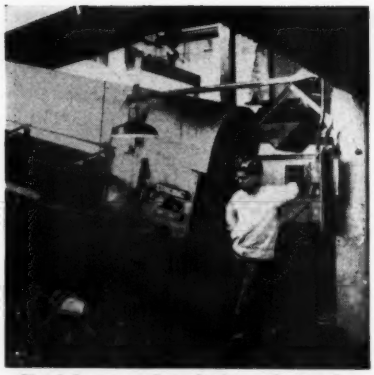
This type cleaning unit has continued to hold its important place where special problems are encountered when it is desired to prepare large quantities of coal.

More Tables Used

The use of this method for wet washing fine coal has grown by leaps and bounds. With more coal loaded mechanically, there has been a marked increase in the percentage of fine sizes. Of more importance, there has been an increase in the amount of free impurities in these fines. The heavy media and other devices installed have been best adapted for cleaning plus ¼-in. sizes of coal. Thus, to round out mechanical cleaning of the product, the number of concentrating tables in use has increased.

New Air Cleaning Plant Built

This method of cleaning has continued to be favored on certain types of coal. In part, this is due to increase in efficiency of the air cleaning units. The trend during the past year has been toward pre-drying the raw feed by thermal means. The need for this was developed by an increase in the spraying of fine coal at the face for dust suppression reasons.



Sized lump coal is laid gently in the railroad cars after passing through the cleaning plant

In 1951, the first commercial installation of a new air cleaning unit was made in the United States. This was originally developed by Brusset in Canada, and has the advantage of using less horsepower. Also, it is a no dust collecting system. This unit is reported to be doing a commendable job.

Dense Media Washers Progress

The Chance sand flotation washer continues to move forward. Results, where close separation is required, are outstanding. This past year saw the first commercial installation in the United States of a Chance cone with a middling draw.

For the increase in number of installations and total tons of coal washed per hour, over the year 1950, heavy media installations exceed all others. There was a definite trend from the cone type to drum type vessel. A dual drum type washer, where a clean coal and middling product could be made, also appeared on the market.

In addition to the conventional drum and cone type washer, there appeared two new types in the heavy media field. One was the Tromp heavy media washer which was introduced in this country from the Netherlands. The other was the Aikens type classifier heavy media vessel which was developed by Southwestern Engineering Co. With the latter vessel, it is possible to have several different middling draws.

Flotation for Fine Sizes

Although the number of units installed of this type washer is small, considerable study has been given to cleaning very fine sizes of coal with this method. It is anticipated that in 1952 many more units will be installed. These, when used in connection with cyclone thickeners, are helpful in water clarification, which is progressively becoming more important.

Equipment Selection Trends

The present trend is to analyze different types of machinery developed by each of several manufacturing companies. Then select and install individual items of machinery, especially adapted to each of several increments of the raw product which is to be prepared and processed.

An example of this is the Georgetown Preparation Plant of the Hanna Coal Co. This was put into operation in 1951, and was designed for a raw coal feed of 1500 tph. In this, three separate cleaning circuits are used. They are:

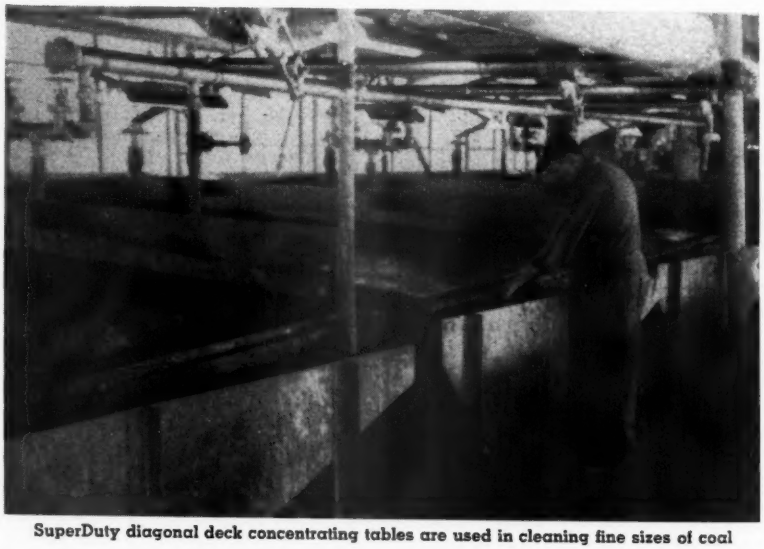
(1) Deister Concentrator tables;
(2) Chance sand flotation washer;
(3) McNally-Pittsburg baum jigs.

These, in conjunction with thermal drying, prepare the finished product. The above are used in combination with efficient settling and clarification of effluent.

This trend includes preparation plants at a number of small mines. For these, small units have been designed and manufactured. For a large percentage of smaller mines, it is not profitable to clean the entire product mechanically. Consideration is then given each increment as to its characteristics and the market to be served. After that, the proper small units are installed to prepare mechanically, one or more portions of the raw product.

The major publicity related to prep-

(*Continued on page* 127)



SuperDuty diagonal deck concentrating tables are used in cleaning fine sizes of coal

Baum jigs again led the field in total tons of coal cleaned per hour

Surface Mining of the Non-Ferrous Metals

Operations, Big and Little, Trend Toward Larger, Safer, More Efficient Equipment and Methods

By W. H. GOODRICH
General Manager
Chino Mines Division
Kennecott Copper Corp.

THE application of surface mining techniques in the recovery of most non-ferrous metals has grown to such a large and varied extent in the past half-century that any attempt to include all phases of this work in such a short space would be impossible. However, a quick study of the major developments during the recent past brings forth information which tends to show what the industry can expect from its surface mines in the near future.

It is becoming more imperative that cheaper and quicker methods of mining be developed, and in most cases this will mean better and more efficient equipment and the use of new techniques. Mining companies and concerns, both large and small, have in the past few years been quite realistic in their viewpoints concerning the interchanging of ideas and methods with others within the industry. Though the spirit of competition must be the driving factor, still in the face of ever-rising labor, transportation and operating costs the free exchange of new information is necessary. This the industry has recognized.

Surface mining improvements are being applied in the extraction of a majority of metals in this country today and operations extend from the very small, involving perhaps one loader and truck, to the large open pit copper mines in the western part of the nation. While these operations naturally differ considerably, in general the method involves the same problems—removal of the stripping and ore-bearing materials in the cheapest and quickest manner possible.

Whether we consider the mining of titanium in New York; zircon, thorium and cerium in Florida; bauxite in Arkansas; uranium in Utah, Colorado and New Mexico; phosphate in Idaho; zinc in the Tri-State region; copper in Arizona, Utah, Nevada and New Mexico, or the mining of other minerals in this country, the same problems seem to exist. We also find that solutions to these problems are being sought in much the same manner—a continuous search for new techniques, machinery and equipment. And, to the credit of the mining industry, we do find a willingness on the part of those involved to share new knowledge with other operators.

New Ventures Under Way

Surface mining methods have improved so greatly during the past few years that this type of operation is now found in many regions where underground methods were formerly used. Naturally, there are many ore deposits that may never be economically recovered by surface-type operations, but today we find ore bodies being mined profitably that could not become producers with any other system of mining.

Among the major new surface mining ventures are the following: The Morris pit at Kimberley, Nev., owned by Consolidated Coppermines, Inc.; the new open pit of the Ray Mines Division of Kennecott Copper Corp. at Ray, Ariz.; and this same company's Kimberley development at Ruth, Nev., by the Nevada Mines Division; the Dragon mine of the International Smelting & Mining Co. at Eureka, Utah; the open pit development of the Phelps Dodge Corp. near Bisbee, Ariz.; the proposed Van Stone zinc operation in Washington state by the American Smelting and Refining Co. and the reopening of the famous Silver Bell copper mine near Tiger, Ariz., by the same company; the new operation of the Anaconda Mining Co. near Yerington, Nev., and many new operations in the western states in the development of uranium. It is also reported that some operating companies in the Kansas-Missouri-Oklahoma region are considering the establishment of surface type zinc operations there.

There are, no doubt, other new mines either in operation or under considera-

Surface mining techniques were established in revived Joplin, Mo. zinc district

tion, but those named above will suffice to show the trend towards the application of surface mining techniques in the various mineral districts.

Trends in Ground Breaking

Whether the ore-bearing material being mined contains copper, zinc, uranium or any other mineral, and whether the operation is small in size or of immense proportions, the fundamental problems of breaking the ground preparatory to loading remain much the same. This phase of the operations, as all others, must be accomplished in the most economical and efficient manner possible.

Through the years this has meant a constant search for new methods and new equipment. Experiments in all types of ground have resulted in a general use of either electrical or diesel churn drills and air hammers Both vertical and horizontal holes are used, sometimes in conjunction with one another and sometimes alone. The diameter and depth of the holes vary with the type of ground to be broken and the explosive used is determined by exhaustive tests carried on at each property.

Engineers and technicians have fairly well perfected the most efficient methods of blasting and the search now bends toward the development of better drilling equipment. In the past year, particularly, new types of drills have been receiving tryouts in different types of ground. Large rotary drills, percussion rigs and jet-piercing units have been tested in many of the larger mines in the west and southwest. As a result, it is safe to assume that these drills might replace some of the conventional rigs of today.

The need for greater mobility and faster boring potentialities have been the prime reasons for these developments, as the ever-changing mining practices continue to improve.

Loading Techniques Vary

As with drilling and blasting procedures, experiments are constantly being conducted in loading practices and equipment. Again economy and the need for greater speed determine the application of any loading equipment. While draglines and small shovels are used generally in the smaller mines, and rotary shovels varying from three to five cu yd capacity are considered standard equipment in most larger mines today, this picture too will change with the future.

The trend, as outlined by the needs of today, will be toward larger equipment with all the mobility of the present machinery. In the smaller mines we find a gradual replacement of one and 1½-cu yd units by two-and three-cu yd shovels and also a transfer from draglines and portable loading machines to rotary shovels.

In the larger operations, which generally have used three to five-cu yd full revolving shovels, there is a trend towards the use of six-, seven-cu yd and even larger machines. These larger shovels, both diesel and electric, are combining the mobility and flexibility of today's equipment with greater power and capacity.

Speed Ore Transportation

Economical transportation of ore has always been one of the big problems in the mining industry, and solutions vary considerably. Distance of haul, grade of climb and amount of material to be hauled must all be considered.

Smaller operations have naturally used either trucks or belt conveyors, while the large open pit operations for many years have considered rail haulage the most economical and practical. In the smaller mines a possible change seems to be a switch to larger trucks, and in the larger mines developments of the past few years point toward a joint truck-rail haulage of both ore and waste materials.

Despite the initial financial outlay in the procuring of trucks, more companies are turning to this type of haulage for specific jobs in expanding present operations or beginning new development work. Their use is limited by many factors—distance and grade of haul, amount of material to be moved and accessibility of rails being the prime considerations. Experiments, however, have proved that in the stripping of a new area or in the beginning of a new drop cut in an already established pit, truck haulage is much faster and more flexible than rail. This also holds true in the establishment of new dump areas in many mines.

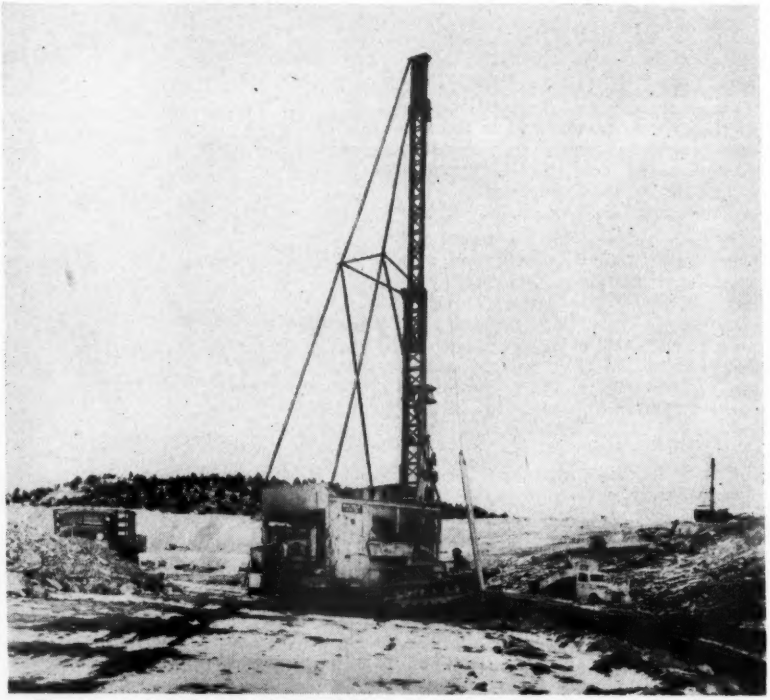
It is doubtful that trucks will ever entirely replace rail haulage, but the new trend is definitely toward a combination of the two. Rail haulage over long distances where many thousands of tons of material are moved each day will continue to be the major type of transportation in the larger mines. Recent experiments with auxiliary truck haulage in these same mines, however, show the definite advantages of both types.

As experiments with truck haulage have shown the value of this type of equipment, so have trials of power equipment shown the advantages of modern maintenance methods. Power tools to remove and replace the huge tires have been successful, and torque-converter type trucks are proving more economical in the long run than conventional types.

A general trend is for larger trucks and the 15-cu yd units are being replaced in both large and small mines with those of 22-ton capacity. Current demand is for even larger ones.

Radio Proves Worth

The value of constant communication between the various departments in a mining operation have long been known, and as fast as new communications and signal systems are perfected they are put to use by the



Experiments in all types of ground have resulted in general use of electric or diesel churn drills

mining industry. Chief among these recent developments is the adoption of two-way radio by most operating companies. Tried in recent years in the larger mines as an experiment, these sets are now considered standard equipment.

Used in conjunction with already-established telephone communications, they have proved invaluable in all phases of the operations. Not only has radio communication been used successfully in the larger mines, it is now being extensively used in the smaller mines and as a source of communication between mines and associated reduction and power plants.

Radio has materially improved operations primarily in routing trucks and trains and has cut repair costs considerably by speeding up this phase of operations. In effect, radio has kept large mines small in a communication sense, while the mines have continued to expand physically.

In mines with extensive track systems, experiments have proven the value of automatic signal and switching systems. This particular improvement is not only being considered by many of the mining companies, but centrally-controlled traffic systems are already in use or on order at many of these properties.

Safety Emphasized

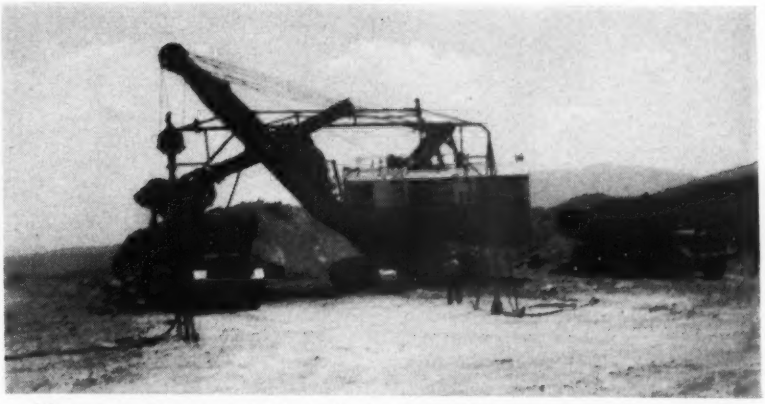
An attempt has been made to point out some of the recent developments in the non-ferrous mining industry insofar as the surface mines are concerned, not particularly from a production point of view, nor from one in which only new operations are considered. Rather, mention has been made of techniques and equipment because the continual improvements in tools and their operation are a vital characteristic of the entire mining industry.

Along with these, great emphasis is placed upon human safety by all mining companies. Nothing is left undone in the steady search for methods and equipment that will protect employes and help make them safety conscious.

Mining is becoming safer largely because of the willingness of management to recognize that this phase of the operations must be given first priority.

Safety departments are universally maintained and the use of moving pictures, posters, and statistics is supplemented by lectures and general safety meetings in most mines. There are few, if any, mines where each employe does not have the opportunity to learn the safe way of performing his duties.

All new equipment, while being designed primarily to fulfill specific mining needs, must also pass rigid safety requirements. This factor may have retarded the development of new equipment and procedures in some instances, but is certainly worthwhile and a phase to which the mining industry can point with pride.



More companies are turning to trucks for specific jobs—expanding present operations, beginning new ones

All Out Effort Required

This article has dealt briefly with generalities of the mining industry as reflected in surface mining operations because it is these generalities that characterize the industry. In these times of great demand for non-ferrous metals from all parts of the world, and with world conditions making it imperative that our nation be first among the producing nations, the American mining industry has accepted the challenge.

Known deposits are being exploited to the fullest possible degree and a constant search is going on by all major companies for new mineral deposits. These are not times when normal efforts are enough, nor are they times when a mining company can survive by continuing to operate with yesterday's techniques and equipment.

For these reasons, the most significant new developments in surface mining in the non-ferrous industry are those of a technical or equipment-change nature. They are the developments which show the mining industry is (1) efficient enough to meet all demands placed upon it, (2) versatile enough to change with the times, and (3) aware enough of its importance to the continued strength and prosperity of America that it is insuring its future by looking for tomorrow's mining methods today.

Silver

(*Continued from page* 108)

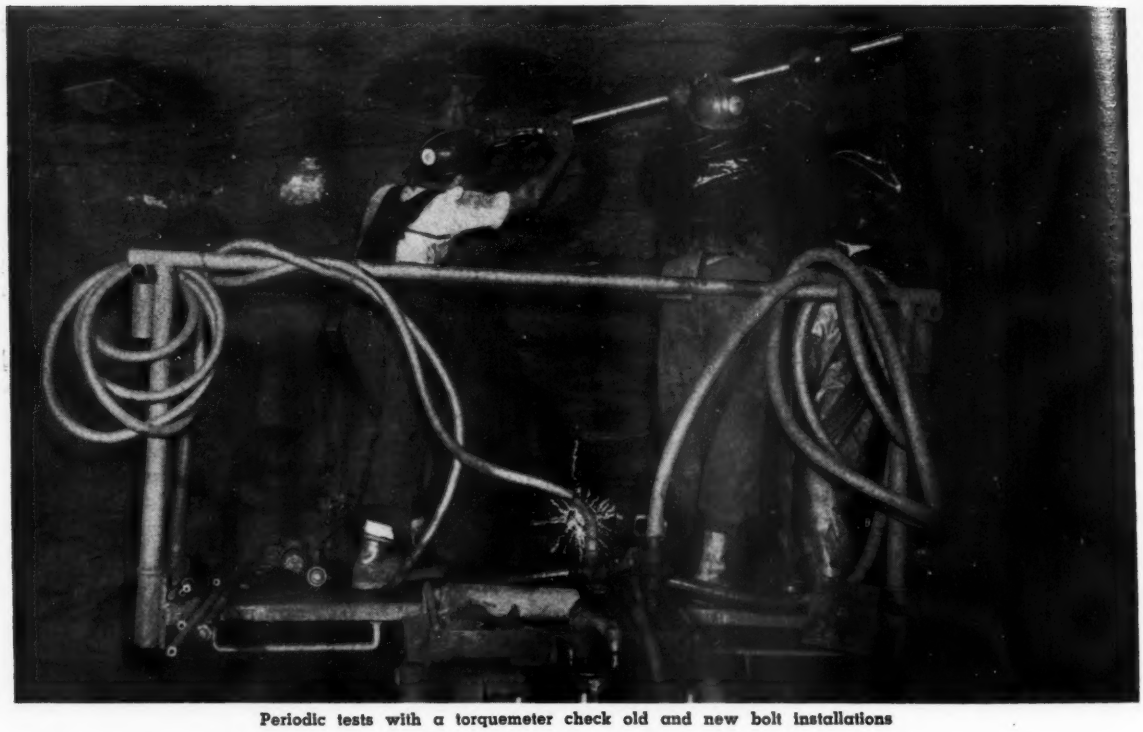
market price were to exceed the Treasury price is fast diminishing.

It appears to me that in view of declining "free" silver in its vaults and rising coinage demands, the Treasury will soon have to consider the point beyond which it cannot afford to sell silver to industry. When the "danger" level is reached the prospect of large quantities of Treasury silver being either dumped on the market or sold to industry will vanish and this block to a market price rise will likewise disappear.

As for the Treasury buying price itself, I believe that the time may not be far away when Congress will restore the monetary buying price of $1.29 an oz. The compromise price of 90.5 cents an oz established by the Act of July 31, 1946, is inadequate. Since the passage of this act the costs of mining have nearly doubled, and coinage demands have increased manifold.

A further test of inadequacy of the present Treasury price is seen in the fact that foreign silver is produced at much less cost and yet sells just 2½ cents an oz below the price which our miners receive.

A higher Treasury price for domestic silver would (1) ease the pressure of rising mining costs on our producers; (2) stimulate the production of critical base metals of which silver is a by-product; (3) not cost the taxpayer one cent; and (4) would not contribute to inflation. I have stated many times in the past that payment of the full monetary price of $1.29 an oz to domestic producers is proper and justifiable. Today, the additional factor of a continuing, indefinite period of rearmament dictates that we resort to every sensible means to assure adequate supplies of the sinews of war—strategic and critical metals. Establishing a Treasury price of $1.29 an oz for domestically produced silver would contribute to the health of a vital segment of our economy and thus promote and facilitate the defense effort.



Periodic tests with a torquemeter check old and new bolt installations

Roof Bolting

New Refinements in Techniques and Testing Insure Continued Spread to New Fields

By H. J. BROUGHTON and LELAND H. JOHNSON

Assistant Chief Engineers
Coal Mines and Ore Mines and Quarries
Tennesee Coal and Iron Division
United States Steel Co.

A REVIEW of developments in roof bolting during 1951 shows a trend toward additional refinements in techniques and testing. This method of roof support is rapidly expanding, and according to the U. S. Bureau of Mines, installations are presently in use at 508 coal mines and 52 non-coal mines in 20 states. West Virginia has the greatest number of bolting installations in coal mines, and Alabama is the leader in non-coal mines.

Developments during the year in the various mining areas consisted primarily of gaining experience and making revisions in equipment and operating practices as required. This review relates experience at the coal mines, ore mines and manufacturing divisions of the Tennessee Coal and Iron Division, United States Steel Co., and are probably typical of those encountered elsewhere.

Used on Regular Basis

Roof bolting was started experimentally at Concord Mine of T.C.I. in May, 1948, and was undertaken on a regular basis at Concord in June, 1948. Since this time all roof exposed at Concord Mine has been bolted.

As of October 1, 1951, Concord Mine had 9,891,246 sq ft of roof area bolted with 762,690 bolts. The total area of bolted roof in all mines was 12,763,094 sq ft with 935,937 bolts set. At the present rate of operation Concord is pinning approximately 455,000 sq ft of roof and using 30,000 bolts per month.

Bolting Methods Tested

In the early or experimental stages of roof bolting at T.C.I., experiments were conducted with different methods of drilling and it was found that the nature of the roof dictated the use of a stoper type drill. This also placed equipment at the face to set the slotted-bolt-and-wedge type roof bolt. Experiments with other anchorages and a series of bolt pull tests on all types of bolts, showed that best anchorage in this roof strata was obtained with a one-in. round, slotted-bolt-and-wedge set in a 1¼-in. roof hole. The bolt is of rivet steel, of varying lengths, and the wedge is ⅞ in. by ⅞ in. by 6 in. long. All component parts of a complete bolt set, including channels, are standard for both coal and ore mines.

Roof strata in Concord Mine varies greatly without visible signs of change and consequently presents many problems. During the development of the mine, roof characteristics were classified into three types in which roof bolts might be anchored; sandstone, relatively hard shale with or without sand or sand stringers, and soft weak shale. In the original workings massive sandstone strata were encountered adjacent to the coal seam and several feet above it. Where the roof

conditions are such that roof bolts can be anchored in this massive sandstone, normal systematic spacing on four-ft centers in rows four-ft apart is followed. As the mine spread out, it was found that in certain areas the sandstone was separated from the coal seam, up to 16 ft or more, by relatively hard, laminated shale becoming sandy shale as it approaches the overlying sandstone and with occasional sand stringers. For anchorage in this type roof, pinning together thin strata to form a beam proved strong enough to support the roof with the same spacing used in sandstone. Alternating four and six-ft bolts are used in an effort to avoid a horizontal plane of weakness induced by setting all bolts at the same depth. Boxed-in intersections with cross-collars bolted to the roof and conventional timbers set under their ends are installed as a precautionary measure.

Elsewhere in the mine a third type of roof was encountered. Here, the rock strata between the coal seam and the sandstone in which the roof bolts are anchored are thin laminas of fossiliferous weak shale. Thin coal seams occur in the first 6 to 12 in. above the coal seam with numerous carbonaceous partings in the strata both below and above the point of anchorage. Concretions were found in the shale strata in the first three or four ft above the coal seam in several localities. In such zones of extremely weak roof, bolts are not enough, and conventional wood timbering must be added. Several methods of timbering have been experimented with, and at present intersections are boxed-in with bolted cross-collars on four-ft centers with conventional wooden timbers set under their ends. Additional rows of conventional timbers are set on four-ft centers across crosscut intersections and in the center of places as roadways are discontinued and on either side of the track haulage allowing necessary clearance for safe operation. In areas of very fragile roof in low seam operations where only four-ft bolts can be used, bolts are set on four-ft centers with 3-in by 10-in. by 30-in. headers between roof and shin plaster to give larger bearing area to each bolt. One line of conventional timbers is set with T-boards[1] to act as "listening posts." At intersections four- or five-in. channels are set on four-ft centers with two carrying-channels boxing in the intersection. The channels are bolted and posts set under the ends of carrying collars. All end bolts are driven at an angle over the ribs and interlace at all corners.

Timber Used Also

Initial examination of roof after coal extraction gives no indication of roof conditions in the immediate area, except where vertical joints are plainly visible. A definite system of vertical joints is present throughout the mine, and produces an unpredictable situation when combined with fragile roof. Where observed, the two sides of the joint are laced together with roof bolts driven at an angle across the vertical surface. Often "pots" or "kettle bottoms" are hidden by a thin layer of badly fractured shale or coal. In such cases, roof bolts are supplemented with wood timbers as requirements dictate.

[1] A T-board is a 3 by 10 by 30-in. cap piece.

Developments in 1951

(1) Previously, all drilling was done wet. At the turn of the year a dry-type dust collector was developed and underwent its first underground tests at Concord Mine. Extensive dust samples consistently showed counts well within accepted standards. Drilling costs and stoper maintenance costs were reduced with dry drilling and the stoper operator's working conditions improved. During 1951 the program of obtaining dust counts for maintaining collecting efficiency has been continued. An improved dust collector has also been installed making disposal of collected dust easier.

(2) An extensive diamond core drilling program was inaugurated to collect sufficient information to permit plotting a better picture of the strata into which roof bolts are to be anchored. The cumbersome nature of the core drilling equipment now available, has hindered prosecution of this program. However, development

Dust collectors are used in some mines while wet drilling is practiced in others

Impact wrenches tighten roof bolts to the required 300 to 400 ft lb of torque

of a lighter diamond drill will greatly expedite this work.

(3) Early in 1951 a booklet on "The Care and Operation of the Stoper Drill" was prepared and published. Specific instructions were given to all supervisors at each mine, and the actual operations of roof bolting were practiced underground by each group of supervisors. Thus, every supervisor was trained to be proficient in instructing his own roof bolting crew.

(4) Prior to 1951 torque tests were made intermittently with experimental roof bolting. During the year torque testing equipment was furnished all mines, and routine torque readings are taken and published at each mine. This practice has greatly assisted the bolting crews in getting the prescribed 300 to 400 ft-lb torque on roof bolts.

(5) Periodic pull-tests were made with an improved, pull-test machine to determine the constancy of adequate bolt anchorage. Remarkably few of the bolts tested have shown any slippage at the anchor point. All bolts tested have been loaded until they failed in tension. Failure occurs in the threaded area of the one-in. bolt in the vast majority of tests at 20 to 22 tons pull.

The trend of frequency figures relative to roof fall accidents at Concord has been very encouraging and point to the success of roof bolting there.

Frequency—Roof Fall Accidents—Concord Mine

	1947	1948	1949	1950	1951 (Through September)
Frequency	15.85	4.77	4.28	0	3.74

Frequency and Severity—All Accidents

	1947	1948	1949	1950	1951 (Through September)
Frequency	19.36	17.59	7.83	8.57	7.96
Severity	8.24	7.09	5.27	4.05	1.38

Ore Mines

The ore mines of T.C.I. began roof bolting at No. 4 Mine in July, 1948. Expansion was quite rapid to the other seven mines, and during 1951, 307,000 bolts were placed covering approximately 7,700,000 sq ft of roof. This required approximately 1,850,000 ft of drilling in sandstones, shale and slate. In conjunction with bolting, 75 diamond drill holes from 10 to 12 ft in depth were drilled to study roof strata and determine the best horizon for bolt anchorage.

Progress Studied

After three years of bolting practice, a complete re-study was made in 1951, and specifications were revised and re-published to meet present findings. These studies indicated major changes as follows:

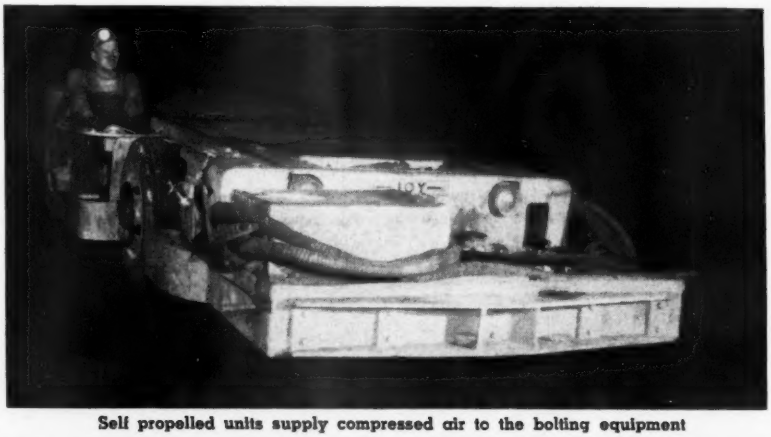
(1) In top that had been severely folded or had slips and fractures, it was necessary to increase the bolt length to 10 ft. Bolts are normally provided in five- six- and eight-ft lengths.

(2) It was found that some crews did not allow a minimum of 20 seconds for drive-up time to set the wedge in the bolt. There was also some damage to the threads on the bolt. Every crew was given additional training for adequate drive-up time and also to use a short rod for holding the plate or washer against the top to prevent damage to threads while driving.

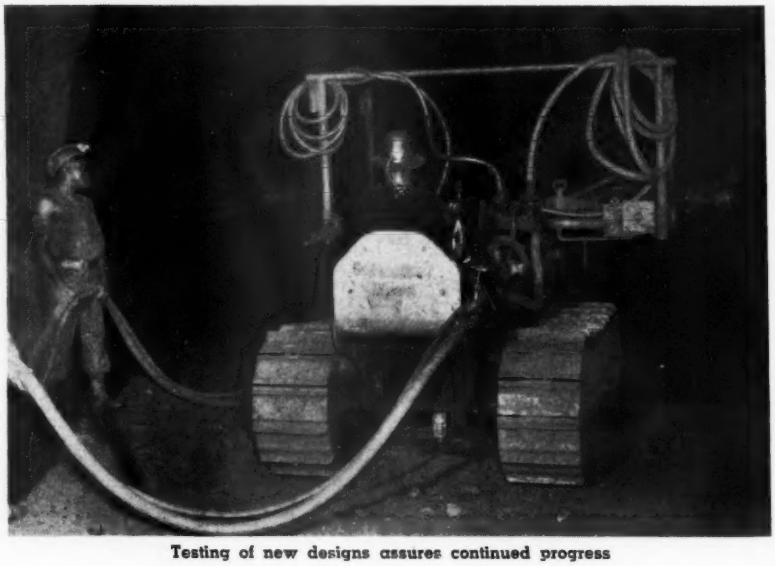
(3) Torque tests are routine for safety inspectors. This checking of back bolts, as well as those currently being installed, has done more to train bolting crews in good operating practices than anything else. Experience has shown that the desired readings should fall between 300 and 500 ft-lb. The thin but tough laminated roof strata at the ore mines, require a higher foot-pound torque than generally used in coal mines. When torque readings are generally under 300 ft-lb in a section, the impact wrench is sent to the repair shop on surface for testing and repairs.

(4) Angle washers used on channel installations have been 2 in. by 3 in. by ⅜ in. In heavy top, the washers had been bending and breaking, but increasing washer thickness to ½ in. has remedied this condition.

(5) Tungsten carbide chisel-type inserts in alloy steel rods are used to drill roof bolt holes. Footage per steel ranges from 70 to 200 ft before regrinding or retipping is necessary. Reground steel is painted one color



Self propelled units supply compressed air to the bolting equipment



Testing of new designs assures continued progress

and retipped steel another so that sets of properly gauged steel can readily be made.

(6) Bolt spacing was reduced from five ft to four ft at four of the eight mines. Depth of cover, numerous local folds and an increase in the number of slips caused a more hazardous roof condition requiring the closer spacing.

(7) A new design in roof bolt carriage provides a more compact machine, a self-leveling platform, improved controls with greater maneuverability.

(8) A dry dust collector was tested during roof drilling and driving of bolts, even though water is available at every working place and wet drilling is standard practice. Air samples indicate that results are well within accepted standards when the equipment is used properly and kept in good condition.

At the ore mines it is believed that the disadvantages of wet drilling are fewer than those of the presently developed dry collectors. No immediate change from the present use of water is contemplated. A number of stopers are already equipped with a control valve that provides a "water on—air on—air off—water off" cycle that prevents dry collaring. All stopers will soon be similarly equipped.

(9) A marked improvement in safety since the adoption of bolting is shown by a comparison of accidents in 1947 when conventional timbering was in effect, and in 1951 with roof bolting utilized. There were 36 rock fall accidents in 1947, 16 in 1948, three in 1949, three in 1950, and four through the first 10 months of 1951.

Make Own Bolts

A major change during 1951 has been the installation of a completely new assembly line for the manufacture of roof bolts. This line was designed and developed by T.C.I.

Rods are received from the mill in 24- and 25-ft lengths. They are of mild, rivet grade steel that meets the USBM recommendations. The rods are 0.906 in. diam, and are sheared on an automatic double-bar shearing line in lengths from 3 to 10 ft. Automatic conveyors carry the rods to a two-unit chamfer machine, thence to a cold rolled threading machine that threads to one in. diam. An automatic live table conveys the rods to a four-unit, continuous gas-operated furnace where about nine in. on the rod opposite from the threads are heated to approximately 1450° F. The rods are then conveyed to an automatic slitting machine that makes a six-in. slit on the heated end. Finished bolts are first bundled in groups of six and then in sets of approximately 100 bolts.

This completely automatic assembly line will average 30 bolts per minute or about 12,000 bolts per eight-hr shift. Variable speed motors permit flexible operation, and emergency switches at strategic locations allow any one operator to stop the assembly line for safety purposes or failure of equipment.

Wedges are made on a completely automatic, three-burner unit where six wedges are made with each pass of the torches. Other roof bolting supplies are made on standard shop equipment in any quantity needed.

Roof Bolting Will Grow

Generally, it is the opinion of the authors that roof bolting will continue to spread to other coal and non-coal mines. Future installations will have the benefit of experience from neighboring mines and the knowledge gained by state and federal inspectors. Accident records show decided decreases with this method of roof support along with better ventilation, better quality of product, and more tons per man in many cases at a substantially lower timbering cost.

Gold

(*Continued from page* 110)

what it will be depends upon a great many factors having to do with the prosecution of the war and settlement of the peace. Wars have never been deflationary.

As might be expected in a year of war, no progress was made toward the use of currencies redeemable in gold, in any important country of the world. Some of the smaller countries moved closer to achieving gold convertibility, but these instances were largely the result of changes in the amount and terms of trade brought about by the war conditions.

Depreciation Continues

The international currencies, the United States dollar and the pound sterling continued to depreciate in internal buying power as price levels rose substantially, and paper money commanded less of commodities and services.

Mine operators in the United States have had time to reflect that this is the only important gold producing country that has not made it possible for mine operators to sell gold for industrial uses at premium prices. Nor is there much likelihood of their securing the benefits of world-market prices until public opinion recognizes that the dollar of 1952 is not the dollar of 1949 nor the dollar of 1939. Labor unions long have recognized that they were receiving a different kind of dollar from their employers. Yet the United States maintains the fiction of the same value of the currency when it is tendered in payment for newly mined gold.

Outlook Brighter

However, there is cause for optimism in changes of policy during 1951. Interest rates increased substantially during 1951, thus indicating a willingness on the part of the monetary authorities to face reality. Attempts were made to control the amount and uses of bank credit on a voluntary basis. The outcome of the September 1951 action of the International Monetary Fund shows that the people of the leading western countries are not ready for concentration of all gold into monetary stocks. They have demanded that individuals be allowed to maintain personal savings in the form of fabricated gold. And for the first time in several years, substantial amounts of gold have become available for purchase by individuals, in lawful markets. Only the United States Government has not chosen to follow this worldwide trend.

Data on Soviet gold production and inventories have not been available for many years. Such fragmentary information as becomes available indicates that Russia continues to be one of the leading producers of gold. Sales of gold of probable Soviet origin have been reported from time to time in various official and unofficial markets of the world, in exchange for foreign currencies which are urgently needed to supplement the barter agreements that occasionally have been worked out with other countries.

Coal Preparation

(*Continued from page* 120)

aration has been about the spectacular large plants installed at tremendous capital cost. From this, there has been a widespread impression that small mines could not afford the high capital expenditures thought necessary to provide a coal washing plant. Due to that impression, at a great many mines, even preliminary consideration has not been given to cleaning coal mechanically. At present, however, there is an increasing trend to study the product with a view to determining whether or not mechanical cleaning of any, or all, increments of the raw product is warranted.

Recent quotations and estimates show that by proper selection and planning, coal produced at medium-sized and small mines can be prepared mechanically at a per ton capital and operating cost competitive with the per ton cost at the large mines where tremendous capital expenditures were warranted.

Modern machinery starts uranium ore from face to atom labs

Carnotite ore often occurs in lenses

Uranium

Exploration Discloses New Deposits In Hitherto Unsuspected Host Rocks as Mining Activity Increases

Prepared with the cooperation of the staff of the U. S. Atomic Energy Commission.

IN 1951, uranium was found in more places and in more kinds of sedimentary rocks than ever before. New discoveries stretched the boundaries of known areas and started prospecting booms in new ones. At least a half dozen new formations were found to be favorable host rocks. But the best measure of 1951's exploration achievement is that two new mills or ore buying stations are slated for 1952.

Industry and Government also kept up the pace in improvement of tools and techniques of exploration. And finally, geologists got together on some working hypotheses for finding ore, although new questions continued to be asked faster than old ones could be answered.

Craven Canyon: Most exciting single strike was probably the discovery of carnotite in Craven Canyon, eight miles north of Edgemont, S. D. The discovery opens up a new favorable formation and a tremendous new area where it outcrops in South Dakota and Wyoming.

J. C. Brennan of Rapid City, examining Indian pictographs in Craven Canyon last August, recognized the yellow mineral and took some samples. Before he could say "potassium uranium vanadate," the Canyon was filled with claimstakers. Activity rapidly spilled over into Red Canyon to the east and into Coal Canyon to the west, where other interesting strikes were made.

In Craven Canyon, carnotite occurs in the Lakota sandstone for a distance of 2½ miles along the canyon walls. Thicknesses up to 15 ft of the Lakota are stained yellow but the potential ore bearing zones seem to be three or more horizons each two or three ft thick containing one-in. lenses of carnotite.

One geologist, familiar with uranium deposits, lists Craven Canyon as one of the best surface shows he has seen. But detailed geological study will have to wait until the snow disappears. Meanwhile the AEC plans airborne reconnaissance to seek new radiometric anomalies in the area.

Grants, N. M.: With Anaconda's new mill on the drawing boards, the Grants area in New Mexico should graduate soon from the prospect to the producing stage.

Early discoveries in the Todilto limestone, blocked out by Anaconda and Santa Fe in 1951, have been buttressed by new discoveries. These new finds, in sandstone beds as well as in limestone, are rapidly extending the favorable uranium area.

In the Brushy Basin sandstone, stratigraphically above the Todilto, one deposit is already being worked by a small operator. During the summer, Laguna Indians came up with a discovery in the limestone on their reservation, 20 miles east of Grants. On the heels of extensive negotiations with the tribal council, Anaconda is now prospecting there. A few weeks later AEC geologists on reconnaissance discovered uranium minerals in the Westwater sandstone in that area to open up another favorable formation.

On similar reconnaissance work north of Thoreau, N. M., the same crew found two low grade ore bodies in the Recapture sandstone. This is the first record of important mineralization in the Recapture. It extends the known favorable area 14 miles west.

Upshot of this mushrooming is a new high in activity in Grants. Anaconda, building the first mill to handle limestone ores, may add a circuit to treat the new sandstone discoveries. When ore-buying starts in 1952, numerous small operators should be able to get into production.

Colorado Plateau: Affairs were far from a standstill on the Colorado Plateau, still the backbone of U. S. uranium production. Drilling on the north side of the Lukachukai Mountains in northeast Arizona, begun in 1950, blocked out substantial reserves in 1951. Most mineralization is in the familiar Salt Wash sandstone of the Morrison formation. Typically, carnotite occurs with vanoxite in mudstone seams and sandstone. "Rolls," characteristic of other Salt Wash deposits, are present but in the Lukachukais they carry little uranium.

Extend Drilling Program

For 1952, a drilling program is being readied on the south side of the mountains. AEC geologists, after painstaking reconnaissance, hold high hopes that this area will prove as good a prospect as the north side. Right now engineers are building roads to drill sites in this rugged country.

Mining has already commenced on the proved mesas of the Lukachukais. Ore developed will probably be trucked to Shiprock, just across the border in New Mexico. An ore buying station is planned there for 1952. Possibly a mill will follow.

Green River: At the Bow Knot mining claims, 51 miles down the Green River from Greenriver, Utah, a new area of potential production has been disclosed. Original discovery was made by Excalibur Uranium Corp. They prospected the Shinarump outcrop along the Green River canyon walls from where the Shinarump emerges a few miles north of Bow Knot to Bow Knot itself. They later flew the area with radiometric equipment, picking up several more anomalies which warranted staking.

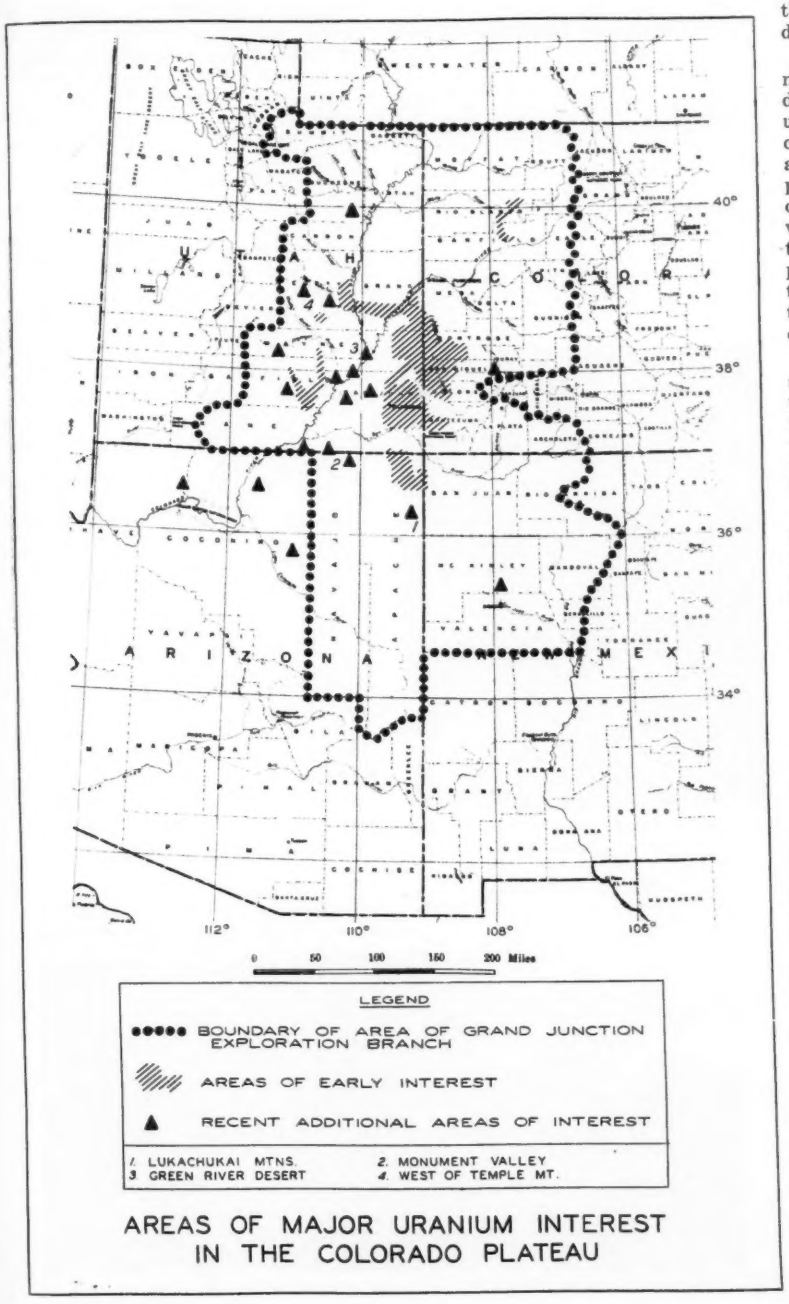
When it comes to adverse conditions, the Bow Knot may well take the prize. No access roads are available. Mining equipment has to be floated down the Green River. Personnel and supplies are flown in. The company is cutting a road to the canyon bottom through almost 900 ft of resistant Kayenta and Moenkopi sandstone. AEC field men raised eyebrows in the home office by requisitioning a boat for work in the Green River Desert. However, a boat is almost the only practicable conveyance for reconnaissance.

Uranium minerals here occur in the channels of ancient streams. Cross-sections of these channels are exposed in the Shinarump formation along the canyon walls. In many places streams scoured as deep as 10 ft into the underlying Moenkopi. Studying the cross-sections from the river has been the chief form of reconnaissance to date.

Moab: At Seven-Mile Canyon, 12 miles west of Moab, Utah, bulldozing during late summer uncovered copper-uranium minerals in the Shinarump conglomerate. Private enterprise is already at work on some of these deposits on the north side of the canyon; one 8-ton shipment was made in November. The uranium mineral is yet to be identified but is probably a sulphate. While the copper is found in the Shinarump, most uranium seems to be mainly in the upper few feet of Moenkopi.

On the south side of the canyon, stripping of the Chinle-Moenkopi contact (the Shinarump is absent) has uncovered enough interesting deposits to keep prospectors stirred up. Incidentally, more and more pitchblende is being found as the area is worked.

White Canyon: Improvements in metallurgy of copper-uranium ores promise increased production from deposits of that type in southern Utah. The Happy Jack mine, in White Canyon, has been star performer of this class to date.



AREAS OF MAJOR URANIUM INTEREST IN THE COLORADO PLATEAU

Drill Vein Deposits

Marysvale, in south central Utah, is still the most important district as far as vein deposits are concerned. During the year drillers punched down 35,000 ft of hole. The most interesting 1334 ft of this footage went into a hole that probed under VCA's Prospector Mine. This is by far the deepest drilling yet attempted. At several points between 1030 and 1095 ft the hole cut a highly altered zone containing calcite, pyrite and fluorite with some radioactivity. The question is: "Is this the Prospector vein?" If so, the deep extension of the vein gives the Marysvale camp a bright future.

Notable underground developments in 1951 were the opening of the Prospector 300-ft level, the Freedom No. 2 (VCA) 160-ft level, and the 55-ft level of the Bullion-Monarch. VCA is driving a 1600-ft crosscut from the 300 level of the Prospector to the Freedom No. 2. A vertical shaft at the midway point will service both mines. (By way of dividend, the crosscut will intersect three known ore structures

Production from many small mines adds up to a lot of ore

at a maximum depth of 800 ft under the Freedom No. 2.)

Government sponsored drilling will move into outlying areas in 1952. Studies of hydrothermal alteration made this year will help guide exploration.

In the **Colorado Front Range** three projects were in the limelight.

At the Copper King mine, north of Fort Collins, shaft sinking is progressing toward 150-ft level. Vein structure and uranium content on the 100-ft level are encouraging, but miners have a lot of work ahead before they can establish production possibilities.

In the old **Quartz Hill area** near Central City, Colo., operators working on a DMA loan have unwatered the Calhoun shaft to the 600 level. When the water level goes down 20 ft more they will start crosscutting toward the Wood mine. The crosscut will take them under the old workings of the Wood where they can examine the vein structure and check uranium content.

At **Haputa ranch** near Canon City, Colo., USGS drilling has disclosed persistent radioactivity, but how much is due to uranium and how much to thorium remains to be seen.

In the **Boulder Batholith** area of Montana, prospecting continued. One shipment was made from the Clancy district and another was ready as the year ended.

Watch Low-Grade Sources

Coals and lignites received a lot of attention from the USGS in 1951. Several deposits were studied which offer huge reserves of low-grade material. While these deposits are unattractive under present conditions, they could represent a hedge against the future.

Research and pilot plant operations are under way and one full scale plant is under construction to recover the 0.2 to 0.4 lb per ton uranium found in many marine phosphates. Production from any one plant will be small; but in the aggregate, producers of wet process acid in the phosphate chemical and super phosphate field are in a position to make an important contribution to our domestic supply of uranium.

Geologic Concepts

Geology of uranium deposits in the Plateau was the subject of much time, energy and discussion in 1951. The struggle continued between adherents of the hydrothermal theory and syngenetic theory of origin. In 1952, AEC and USGS geologists will continue the quest for an answer.

On one point, at least, geologists now agree. In certain formations, ancient stream beds offer a structural control for disposition. Where these stream beds are present, ore may be found in the channel. This information is now being used for prospecting in the Shinarump. Outlining the channels indicates the area most favorable for drilling.

Meanwhile, geobotanists and geochemists are on the lookout for the more subtle guides to finding ore.

In this Colorado mine ore averages eight ft in thickness

Exploration Techniques Improve

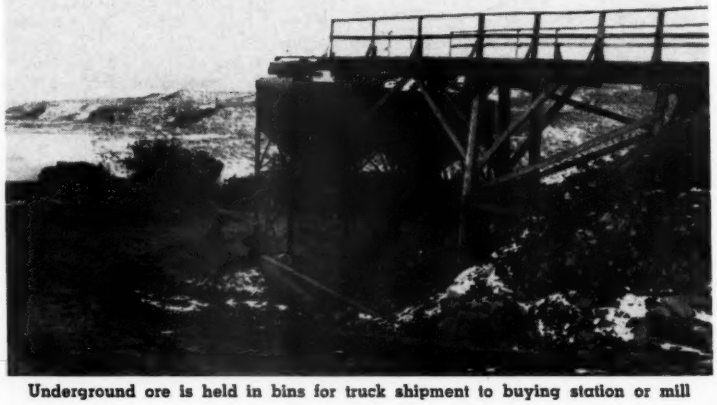
Drilling costs in some areas of the Colorado Plateau were reduced more than 50 percent by substituting wagon drilling for diamond core drilling. A gamma logging instrument run into the drill hole furnishes the necessary information on ore horizons formerly obtained from cores. To date this equipment has been the portable Geiger-tube type. A scintillation-type unit developed in 1951, will give more information, faster and will gradually replace the old type in AEC exploration.

Systematic airborne gamma logging of rim outcrops in the Colorado Plateau got under way during the last half of 1951. Several significant anomalies were recorded in 109 hours of flying time. These anomalies are being studied in the field; already some warrant investigative drilling.

Airborne gamma surveying will be expanded in 1952. Three aircraft manned by AEC personnel will commence operation with scintillation-type detectors. Initial work will be at Edgemont, Grants, and in the Colorado Plateau.

In the Grants area of New Mexico, a surface magnetometer survey was made to check an anomaly recorded during airborne magnetometer work by the USGS. Survey personnel are studying possible relationships between magnetic anomalies and ore occurrence.

USGS studies show that resistivity methods may be useful in delineating favorable areas. Arrangements are being made with the Bureau of Reclamation to continue and enlarge these studies in the Plateau area.



Underground ore is held in bins for truck shipment to buying station or mill

Sales of Coal Mine Equipment

By W. H. YOUNG and R. L. ANDERSON

Chief, Bituminous Coal Section
and Engineer-economist, U. S. Bureau of Mines

Trend Toward Complete Mechanization Continued as Sales of Cleaning Equipment, Shuttle Cars and Face Conveyors Increased

SHIPMENTS of mechanical loading equipment for underground use in coal mines in the United States, in terms of capacity, were approximately the same in 1951 as in 1950. The capacity of mechanical cleaning equipment sold for use at bituminous-coal mines was 14 percent greater in 1951 than in 1950. Shipments of shuttle cars and face conveyors for use in coal mines in the United States increased 13 and three percent, respectively, in 1951 over 1950, while "mother" conveyor shipments decreased 14 percent during the same period.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal mines and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines in the United States. Data from various trade journals were also utilized.

Mechanical loading units and supplementary haulage equipment "Sales in 1951" represent shipments made during 1951. Twenty-five percent of the total capacity of mechanical cleaning equipment sold in 1951 was placed in operation during that year, the remainder will be installed later.

Mechanical Loading Grew

Bituminous coal and lignite mechanically loaded in underground mines increased from 222,375,882 tons in 1949 to 272,724,612 tons in 1950 or 23 percent. Mechanical loading in Pennsylvania anthracite mines increased from 11,858,088 tons in 1949 to 12,335,650 in 1950 or four percent.

Table I shows data on bituminous coal and lignite production by methods of mining and mechanical cleaning for 1949-51, inclusive. The percentage of this total output mechanically loaded and mechanically cleaned continues to increase. During 1951 approximately 77 percent of the total output was either mechanically loaded at underground mines or loaded by power shovels at strip mines.

Underground production of bituminous coal and lignite, by methods of loading, is shown in table II. Preliminary figures for 1951 show that 71 percent of the underground output was loaded mechanically and the remainder, or 29 percent, was hand loaded into mine cars.

Types of units sold. Table III lists the number of mechanical loading and conveyor units shipped for underground use at all coal mines in the United States, 1946-51 inclusive. Shipments of mobile loaders, including continuous miners, decreased from 289 in 1950 to 287 in 1951. Shipments of scrapers and shuttle cars increased 33 and 13 percent, respectively, in

TABLE I—BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1949-51, INCLUSIVE

	1949		1950		1951[1]	
	Thousands of net tons	% of total	Thousands of net tons	% of total	Thousands of net tons	% of total
Surface stripping	106,045	24.2	123,467	23.9	118,000	22.1
Hand-loaded underground	109,447	25.0	120,119	23.3	121,000	22.6
Mechanically loaded underground	222,376	50.8	272,725	52.8	296,000	55.3
Total production	437,868	100.0	516,311	100.0	535,000	100.0
Mechanically cleaned	153,652	35.1	198,699	38.5	225,000	42.1

[1] Preliminary.

TABLE II—UNDERGROUND BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF LOADING, 1949-51, INCLUSIVE

	1949		1950		1951[1]	
	Thousands of net tons	% of total	Thousands of net tons	% of total	Thousands of net tons	% of total
Loaded by machines[2]	191,572	57.7	237,279	60.4	([3])	([3])
Handled by conveyors[4]	30,804	9.3	35,446	9.0	([3])	([3])
Total mechanically loaded	222,376	67.0	272,725	69.4	296,000	71.0
Hand loaded	109,447	33.0	120,119	30.6	121,000	29.0
Total underground production	331,823	100.0	392,844	100.0	417,000	100.0

[1] Preliminary.
[2] Includes mobile loaders, continuous miners, scrapers, and conveyors equipped with duckbills or other self-loading heads.
[3] Included under "Total mechanically loaded."
[4] Includes hand-loaded conveyors and pit-car loaders.

TABLE III—NUMBER OF MECHANICAL LOADING AND CONVEYOR UNITS SOLD FOR UNDERGROUND USE IN COAL MINES, AS REPORTED BY MANUFACTURERS, 1946-51, INCLUSIVE

	1946	1947	1948	1949	1950	1951	Change from 1950 (percent)
Type of shipment:							
Mobile loaders[1]	495	486	725	286	289	287	— 0.7
Scrapers[2]	35	35	49	18	9	12	+33.3
Shuttle cars	([3])	([3])	([3])	543	465	524	+12.7
Conveyors:[4]							
"Mother"	187	204	235	116	133	114	—14.3
Room or transfer	1,157	987	1,209	541	373	331	—11.3
Face[5]	209	225	374	165	116	119	+ 2.6
Number of manufacturers reporting	24	23	22	22	20	21	....

[1] Includes continuous miners, beginning in 1948.
[2] Reported as scrapers or scraper haulers and hoists.
[3] Not available. Total number of shuttle cars sold 1936-48, inclusive was 2849.
[4] Conveyors are classified as to the length the power unit has capacity to take; "Mother," capacity over 500 ft; room or transfer, capacity 100 ft to 500 ft; face, capacity under 100 ft.
[5] Includes "piggyback" conveyors, beginning in 1950.

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TABLE IV

SALES OF MECHANICAL-LOADING EQUIPMENT IN 1951 COMPARED WITH MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators							Number of machines sold as reported by manufacturers in 1951
	1944	1945	1946	1947	1948	1949	1950	
Bituminous-coal and lignite mines:								
Mobile loading machines	2,737	2,950	3,200	3,569	3,980 [1]	4,205 [1]	4,318 [1]	287 [1]
Scrapers	87	87	75	67	56	46	39	4
Pit-car loaders	241	142	93	71	37	17	12	([2])
Conveyors equipped with duckbills or other self-loading heads	1,331	1,383	1,521	1,531	1,632	1,483	1,329	([3])
Hand-loaded room conveyors, number of units	3,236	3,385	3,470	3,979	4,125	4,312	4,434	297
Anthracite mines (Pennsylvania):								
Mobile loading machines	12	20	27	25	19	27	30	...
Scrapers	491	548	564	594	643	589	556	8
Hand-loaded room conveyors, number of units [4]	2,807	3,006	3,233	3,457	3,562	3,618	3,460	34

[1] Includes continuous miners.
[2] Canvass of sales of pit-car loaders discontinued in 1945.
[3] Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[4] Includes pit-car loaders and conveyors equipped with duckbills or other self-loading heads.

Shaker screens are an important step in coal sizing

1951 over 1950. "Mother" and room or transfer conveyor sales both decreased in 1951 from 1950, while face conveyor purchases showed a slight increase during the same period.

Exports of underground mechanical-loading equipment in 1951, in terms of capacity, amounted to 23 percent of the shipments to mines in the United States compared with 14 percent in 1950.

Types of mechanical loading equipment sold compared with units in use. Table IV shows the trend in demand for various types of mechanical loading equipment. There has also been a substantial increase in the use of all types of mechanical loading equipment, except scrapers and pit-car loaders.

Table V shows the number of mechanical loading units shipped to various States in 1951 compared with the number in use in 1950, as reported by mine operators. "Room conveyors" in tables IV and V were listed as "conveyors" in previous annual reports on sales of mechanical loading equipment. The sales of room conveyors are not comparable with room conveyors in use. To avoid duplication in tonnage mechanically loaded, the mine operator was instructed to report only the "hand loaded" and "self loading" conveyors; therefore, room conveyors loaded by mobile loaders are not included with "Room conveyors in use in 1950."

Haulage Equipment

Face conveyors. A face conveyor is 10 to 100 ft in length and is used parallel to the face of the room to move material along the face to a room conveyor. Sales of such equipment are shown in this report for the first time. Table III lists total sales 1946-51, inclusive, and table VI lists sales, by States, for 1950 and 1951.

TABLE V

MECHANICAL-LOADING EQUIPMENT IN ACTUAL USE IN 1950, BY STATES, COMPARED WITH SALES REPORTED IN 1951

	Mobile loaders [1]		Scrapers		Room-conveyors	
	In use in 1950	Sales in 1951	In use in 1950	Sales in 1951	In use in 1950 [2]	Sales in 1951
Bituminous coal and lignite mines:						
Alabama	136	5	7	..	359	1
Alaska	...	...	...	..	1	...
Arkansas	...	...	...	...	74	...
Colorado	45	7	1	2	298	17
Illinois	487	27	...	..	15	3
Indiana	164	1	...	..	4	...
Iowa	2	...	...	..	5	...
Kentucky	508	38	...	..	669	47
Maryland	...	...	...	..	34	...
Montana	30	...	...	..	14	...
New Mexico	17	1	...	..	2	...
North Dakota	4	...	...	..	...	...
Ohio	198	13	...	..	114	...
Oklahoma	5	1	...	..	148	2
Pennsylvania	1,032	58	10	..	930	73
Tennessee	28	3	...	..	145	3
Utah	123	6	1	..	94	2
Virginia	134	5	...	1	188	3
Washington	...	2	8	..	90	...
West Virginia	1,373	119	...	1	2,321	146
Wyoming	32	1	12	..	258	...
Total bituminous coal and lignite	4,318	287	39	4	5,763	297
Pennsylvania anthracite mines	30	...	556	8 [3]	3,460	34
Grand total	4,348	287	595	12	9,223	331

[1] Includes continuous miners.
[2] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[3] Includes also pit-car loaders.

TABLE VI—SALES OF FACE CONVEYORS, SHUTTLE CARS, AND "MOTHER" CONVEYORS, 1950-51, BY STATES

	Face conveyors [1]		Shuttle cars		"Mother" conveyors	
	1950	1951	1950	1951	1950	1951
Bituminous-coal and lignite mines:						
Alabama	...	...	7	26	...	...
Arkansas	...	...	...	...	1	...
Colorado	...	2	5	6	...	6
Illinois	2	...	75	70	16	19
Indiana	...	...	15	4	...	...
Kentucky	20	24	94	46	24	18
Ohio	8	...	24	20	8	2
Oklahoma	...	...	7	...	4	3
Pennsylvania	18	19	111	131	29	24
Tennessee	2	...	...	6	...	1
Utah	...	...	20	8	2	2
Virginia	2	6	2	8	4	3
West Virginia	64	60	99	197	41	36
Wyoming	...	...	6	2	3	...
Total	116	111	465	524	132	114
Anthracite mines (Pa.)	...	8	...	...	1	...
Grand total	116	119	465	524	133	114

[1] Includes "piggyback" conveyors.

TABLE VII

BITUMINOUS COAL MECHANICALLY CLEANED IN 1950 COMPARED WITH SALES OF MECHANICAL CLEANING EQUIPMENT IN 1951, BY STATES

State	Number of plants in operation	1950 Net tons of cleaned coal	Output mechanically cleaned (percent)	Annual capacity of equipment sold in 1951 (net tons) [1]
Alabama	52	11,548,036	80.1	1,503,000
Alaska	2	175,783	42.6	...
Arkansas	2	27,600	2.4	...
Colorado	6	1,277,747	30.0	(2)
Illinois	68	35,695,520	63.4	2,385,000
Indiana	27	14,101,094	70.7	(2)
Kansas	5	1,303,614	61.3	...
Kentucky	68	21,198,829	27.0	1,559,000
Maryland	2	30,343	4.7	...
Missouri	10	2,397,442	80.9	...
Montana	2	160,550	6.4	...
New Mexico	2	74,290	10.2	...
Ohio	21	10,708,879	28.4	(2)
Oklahoma	6	896,344	33.5	...
Pennsylvania [3]	83	38,547,253	36.4	3,918,000
Tennessee	6	353,514	7.0	(2)
Utah	6	2,312,384	34.7	...
Virginia	21	4,796,515	27.2	(2)
Washington	17	781,346	89.4	...
West Virginia [4]	206	52,311,435	36.3	6,839,000
Undistributed	...	...	...	1,786,000
Total	612	198,698,518	38.5	17,990,000

[1] Based on average days mines were active in 1950 and 7.0 hours per day.

[2] Included in "Undistributed."

[3] Includes some coal mined in Pennsylvania and cleaned in Ohio, and a small tonnage mined in other states and cleaned at a consumer-operated plant in Pennsylvania.

[4] Includes some coal mined in West Virginia and cleaned in Ohio and Pennsylvania.

Data on number in use are not available.

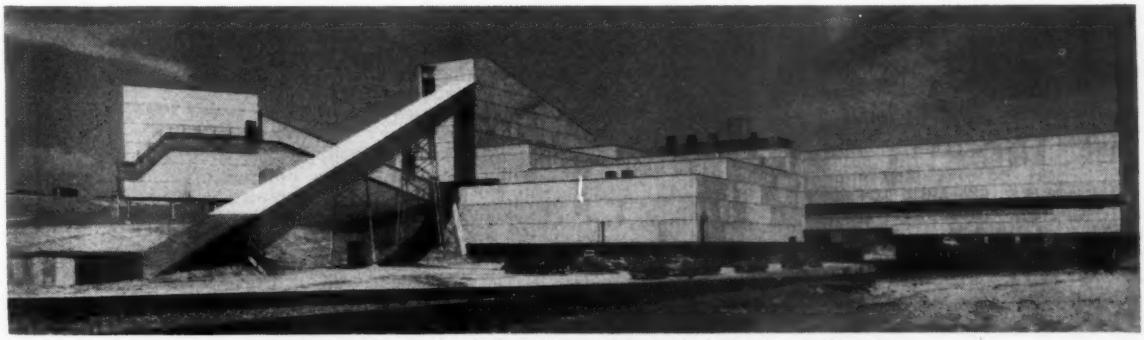
Shuttle cars. Sales of shuttle cars increased from 465 in 1950 to 524 in 1951. Details of shipments to various States in 1950 and 1951 are given in Table VI. There were 3294 shuttle cars in use in bituminous coal and lignite mines in 1950. Details of the number of cable-reel and battery-type shuttle cars in use, by States, in 1949 and 1950 are given on page 26, Bureau of Mines Mineral Market Report No. 2032. Exports of shuttle cars increased four percent in 1951 over 1950.

"Mother" conveyors. For the purpose of this study a "mother" conveyor is defined as a sectional, extensible, power-driven conveying unit that can handle over 500 ft of conveyor. Main slope conveyors are excluded. Table III lists sales, 1946-51, inclusive, and Table VI shows shipments by States, in 1950 and 1951. In 1950, 374 bituminous coal mines used 295 miles of "mother" conveyors. Detailed data by States, on "mother" conveyors in use, 1945-50, inclusive, are given on pages 27 and 28 of Bureau of Mines Mineral Market Report No. 2032. Exports of "mother" conveyors decreased 21 percent in 1951 from 1950.

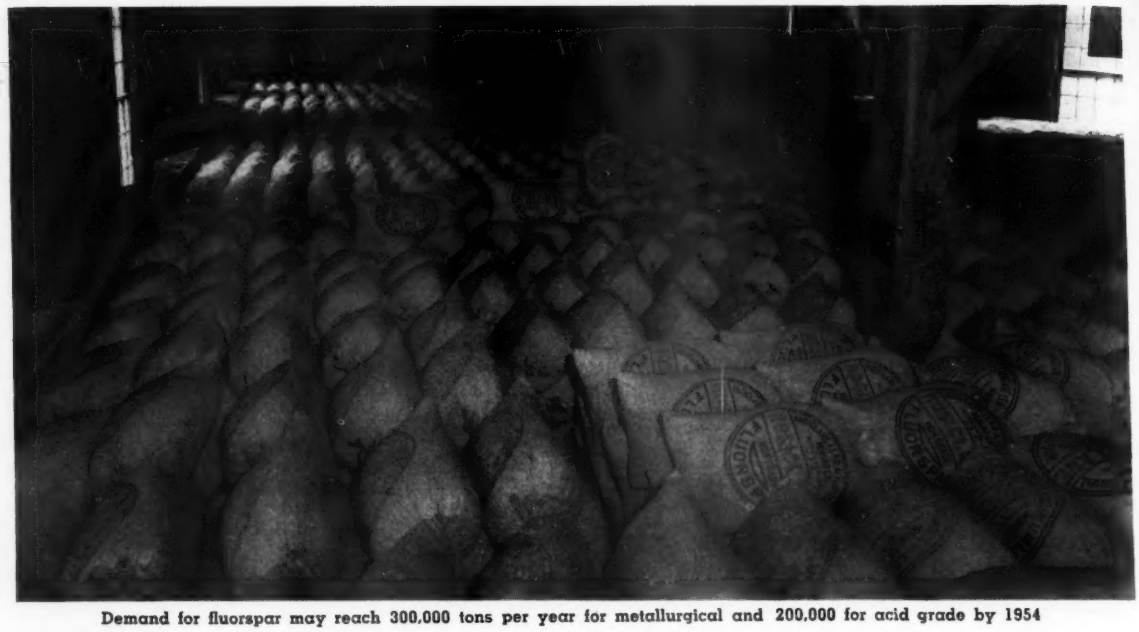
Mechanical Cleaning

Reports from 19 manufacturers of bituminous coal cleaning equipment show that the total capacity of 1951 sales was 13,900 net tons of clean coal per hour, compared with 12,200-ton capacity sold in 1950, an increase of 14 percent. Sales in 1951, by type of equipment, in terms of capacity, show that jigs were first with dense medium and wet tables following. Approximately 60 percent of the total capacity of cleaning equipment sold in 1951 was for additions to present installations and the remainder comprised new plants.

Table VI gives data on bituminous coal cleaned in 1950 by States and the annual capacity of equipment sold in 1951.



Modern coal washeries make full use of mechanical cleaning equipment



Demand for fluorspar may reach 300,000 tons per year for metallurgical and 200,000 for acid grade by 1954

Industrial Minerals

Intense Activity and Development Characterized the Year in Most of the Many Branches of the Industrial Mineral field.

By JOSEPH L. GILLSON
Geologist
E. I. du Pont de Nemours & Co., Inc.

ABRASIVES During 1951 the abrasives industry, both in the United States and Canada, has made substantial additions to its electric furnace plants with a resulting increase in the production of crude abrasives and refractory materials. There have also been some additions to plants manufacturing fabricated abrasive products of all kinds. This activity is due primarily to the demands of the mobilization program and has been accompanied by an increased employment within the abrasives industry.

ASBESTOS Preliminary estimate of production of chrysotile in Canada was 925,000 tons for 1951 as compared with 834,491 tons for 1950. Despite this increase there was inadequate supply in most grades, although shorts were meeting requirements during the later months. The supply of spinning fiber was inadequate for industrial needs and stockpiling requirements are far from filled. Plans for the expansion of production facilities in Canada include a new mill at the Normandie Mine of the Asbestos Corp. and a new shaft and mill at the Jeffrey Mine of Johns-Manville. Imports of amosite, crocidolite, and Rhodesian chrysotile were less than desired. Stockpiles of amosite, Rhodesian chrysotile, and Arizona chrysotile are considerably below present objectives. Bolivian blue is being stockpiled for gas mask usage. Domestic production of short fiber in Vermont increased somewhat, and prices advanced for all grades. An increase in prices for Canadian fibers is anticipated early in 1952. Some shipment of low-iron asbestos, mostly of spinning quality, was made from Arizona. Efforts are being made by the individual operators and the government to increase this output. The Defense Minerals Exploration Administration has given support for six exploration contracts in four states. Some of the major asbestos producing companies have underway large scale exploration programs for the discovery of asbestos reserves throughout the world. The deposit in the McDame Lake district of northern British Columbia is of interest but still unproved.

ALKALIS The raw materials used by the Alkali Industry—limestone, coal, coke, salt and ammonia—were all in plentiful supply throughout the year. Most producers in the Industry planned expansion of their chlorine-caustic plants, however, the salt for these plants, for the most part, would be produced from their present resources.

As the Alkali Industry operated at near maximum production rates during the year, raw material consumption was also high compared with 1949 and 1950.

The Westvaco Chemical Corp., a subsidiary of Food Machinery and Chemical Corp., announced plans late in 1951 for increasing the production of natural sodium carbonate from the Trona deposits in Wyoming. This latest expansion will result in a decided increase in soda ash production for the west coast.

CERAMICS One very interesting development in the high voltage insulation field in 1952 was the completion of the development of a high voltage bushing for use at radio frequency. The bushing is designed to operate at 300,000 v., and with frequencies of 18 to 25 kilocycles. Its over-all length is about 26 ft, and its weight more than 6000 lb. In order to keep capacitance and electrical losses at a low value, conventional type

construction could not be used. Instead the bushing is filled with gas under pressure.

Another important development of 1952 in the insulator field is the continuing trend toward higher voltages for power transmission in the United States. In addition to the projects of the American Gas and Electric Service Corp., which are now well under way, utilities in other parts of the country are considering power transmission in the ultra high voltage field. This poses new problems on basic insulation levels, and the insulator designs suitable for these applications.

The shortage of copper is producing a marked movement toward the use of aluminum conductors for both transmission and distribution circuits. The resulting increased diameter of conductors may influence future insulator designs.

There has been considerable interest in the ceramic field in the barium titanate materials because of their piezo-electric properties. A considerable amount of work has been done by several manufacturers.

NORTH CAROLINA KAOLIN In 1951 the production of primary kaolin in western North Carolina reached 29,000 tons, an increase of 15 percent over any previous year. The Spruce Pine district, as usual, was the principal contributor to this output. About 500 tons of halloisite was mined and refined and shipped to manufacturers of top-grade porcelain. Halloisite occurs, in small lenses, in the Spruce Pine alaskites and pegmatites.

DIATOMITE Production reached new record levels following the trend of recent years, but industry requirements were not fully met for some highly processed filter-aid grades. Additional production facilities by Johns-Manville and Great Lakes Carbon should correct this condition in 1952. Diatomite has become recognized as one of the basic and important industrial minerals used as an almost indispensable tool in the chemical, food-processing and other industries. Its biggest new use is for anti biotics, principally streptomycin, etc. Insecticide filler uses are also up. Fortunately, the United States' reserves of high quality diatomite are adequate for all requirements for many years to come.

Some new interest in deposits has been shown in Portugal, Africa and Australia.

FELDSPAR Demands for feldspar slowed down during the last quarter of 1951. The fourth froth flotation plant in the Spruce Pine district went into operation during the year. This was the new plant of Carolina Mineral Co. The tonnages of fine ground floated feldspar used in the whiteware industry continued to increase.

The feldspar plant of Appalachian Minerals Co. at Monticello, Ga. was partially destroyed by fire in late November, 1951 and the Minpro plant of United Feldspar & Minerals Corp. was burned January 8, 1952. It is probable both plants will be rebuilt.

Competition from Canadian nepheline syenite in the feldspar industry is still on the increase. This is a serious threat to the domestic industry.

FLUORSPAR A large increase in demand for metallurgical and acid grade fluorspar is developing because of expansion in the steel, aluminum and chemical industries. It is estimated that the annual demand for metallurgical grade may reach 300,000 tons and for acid grade 200,000 tons by 1954.

Two new flotation plants were built or being built by the end of the year 1951, one at Meyers Cove, Idaho by the Simplot Co. and the other at Coudrey, Colo., by the Ozark Mahoning Co. At least two others are in the planning stage.

An outstanding development during the year was the discovery of extensive deposits in Northern Coahuila, Mex., a short distance south of the Rio Grande River. By the end of the year shipments of metallurgical grade from this new district, called Encantada, were running close to 5000 tons per month, with the probability that this figure may be increased considerably early in 1952. This new production is easing the present shortage of this grade of spar. It is rumored that one or more flotation plants may be built to concentrate Encantada ore to acid grade in 1952.

Substantial shipments from Spain and Germany have helped to supply the acid grade demand, and it is known that plans for producing acid grade spar in southwest Africa are being made.

GYPSUM In the gypsum industry the year 1951 was characterized by record-breaking production with a background of uncertainty towards the future. In the last quarter of the year this uncertainty materialized with slackening of demand. The Pacific Coast plants were the first affected and were forced to reduce the scale of their operations. This trend was continuing eastward as the year ended.

Governmental restrictions, to reduce 1952 housing starts to about half the 1950 figure, and financing problems were responsible for the decline. Despite its diversification the gypsum industry is still dependent for volume upon the building cycle.

Increases in plant capacity were continued in 1951. A complete new board plant was constructed in Kansas and others were planned for Iowa and Washington. Existing plants were enlarged and modernized.

The U. S. Bureau of Mines quarterly gypsum report for the third quarter indicated that the apparent supply of crude gypsum rock in 1951 would approach a record-breaking 12,000,000 tons, with about 9,000,000 tons mined in the U. S. and 3,000,000 tons imported, mostly from Nova Scotia but with important amounts from San Marcos Island in the Gulf of California. Portland cement retarder reached 1,480,289 tons in nine months, a new record also. While gypsum plasters showed a slight decrease, gypsum board products continued to gain, with a tremendous nine-month total of 4,247,045,000 square feet.

Industrial products increased in volume, diversification and adaptability. Lightweight aggregates, especially perlite, were compounded with gypsum products to yield new fire-proofing materials which may revolutionize some aspects of construction.

LITHIUM The requirements for both lithium ores and lithium chemicals continued to rise rapidly during 1951. These increased requirements were due partly to a number of military uses for lithium products and partly to the fact that lithium ores and chemicals were substituted for other materials in many civilian products. For example, lithium carbonate and finely ground, magnetically cleaned lithium ores replaced much of the lead formerly used in optical glass, television tubes, glass tubing, porcelain enamel, and other types of ceramics. Military uses for lithium include aluminum welding fluxes, carbon dioxide absorbant, low-temperature dry batteries, and lubricating grease.

During the year there were four major U. S. suppliers of lithium ores and concentrates: Foote Mineral Co., Maywood Chemical Works, Lithium Corp. of America, and America Potash and Chemical Corp. Early in the year lithium ore was in very short supply, and, to alleviate the situation, Foote Mineral Co. purchased, rehabilitated, and enlarged the spodumene mines and concentrating mill near Kings Mountain, N. C., formerly owned and temporarily operated during World War II by the Allied Chemical and Dye Corp. The Kings Mountain mine and mill began operations about July 1, 1951. It is believed that currently this North Carolina operation is the largest U. S. producer of lithium ore concentrates.

LIGHTWEIGHT AGGREGATES The lightweight aggregates, including expanded clay and shale aggregates, cinders, perlite, pumice, slag and vermiculite, continued to increase in importance and to expand into new uses and markets, especially perlite, the most recently developed type of these

aggregates. Studies of the clays and shales of various geographic areas indicate additional sources of raw materials for making lightweight aggregates and a considerable enlargement occurred in the body of technical information relating to the properties of clays and shales which cause bloating and to the technology of expanding them by more or less conventional procedures. Departing from the latter is a plant at Salisbury, N. C., in operation for about a year, which produces lightweight aggregate from clay using the Dwight-Lloyd sintering process. The waste slimes from the washing of land pebble phosphate are a recently suggested raw material for making lightweight aggregate by firing.

MAGNESITE Just as the steel industry set a new record by producing over 100,000,000 tons of steel in 1951, so the dependent and parallel magnesite industry set a new record by producing over 400,000 tons of deadburned magnesite. All producers contributed to this record by operating at peak capacity during the entire year. In addition, several companies brought new facilities into operation during the year. Basic Refractories Co. shipped their first deadburned magnesite from their Gabbs, Nev. property after they placed a 390-ft rotary kiln in operation during the year. In addition, they continued shipping raw magnesite and brucite to their Ohio plant for processing.

Standard Magnesia, one of the other operators of the Gabbs deposits, mined and exported raw magnesite during the year. They also produced lightly calcined magnesite for the trade. They will shortly produce deadburned magnesite from a rotary kiln which was partially erected in 1951.

The Chewelah, Wash., operation of Northwest Magnesite Co. continued to be the largest single, domestic source of deadburned magnesite. The combined Nevada operations are running a close second. The large output of deadburned natural magnesite from these sources acted to maintain the established ratio of natural vs. synthetic magnesite in spite of increased production of synthetic magnesite. In past years the production of snythetic deadburned magnesite has been about 35 percent of the total.

The New Jersey plant of Northwest Magnesite completed the installation of a 400-ft rotary kiln and auxiliary equipment. This plant and the California plant of Kaiser Aluminum & Chemical Co. and the Texas plant of Dow Chemical Co. used seawater in the manufacture of their products. Other operations used seawater bitterns or inland well brines.

Basic Refractories Co. put a heavy media plant into service at Gabbs to separate brucite from gangue. They resumed treatment of crude magnesite by flotation prior to deadburning.

The producers of synthetic magnesite revealed no major changes in flowsheets. All of them improved the control of impurities in their products.

Canadian Refractories Ltd. at Kilmar, Que. operated their Heavy Media and deadburning plants at capacity. A new shaft was sunk to develop lower bodies of ore.

British Periclase Co. in England expanded their plant. It is understood that some of the magnesia will be diverted from the manufacture of refractories to the preparation of metallic magnesium.

A new seawater plant was put into operation in Norway by the Heroya Elektrokjemiske Fabrikker.

Harbison-Walker Refractories Co. acquired control of a magnesite deposit in Brazil. Work for the year was confined to exploration.

General Refractories Co. placed a Heavy Media plant into operation at their Austrian operation.

MICA The mobilization program has expanded the demand for strategic mica. Increased imports at higher prices have met the requirement for splittings, but condenser and tube film is still in short supply.

More than a score of mica exploration projects were approved in 1951 and many more are under consideration by DMEA.

Defense Materials Production Administration is considering a mica program with provisions to encourage domestic production and to coordinate with the production of other strategics often associated in pegmatites with mica.

Three firms are experimenting with the utilization of scrap mica to replace imported splittings in the production of built-up mica. Few, if any, of the existing plants are currently equipped to produce the required type of "scrap" but there seems little doubt that adequate domestic supplies will eventually be available. Production of other forms of scrap and ground mica continued to increase.

The shortage of condenser film may be overcome by a microfilm glass.

An improved power-factor meter may conserve condenser mica and lead to greater utilization of green mica.

The use of synthetic fluorine-phlogopite mica as a substitute for block talc shows promise, but acceptable synthetic sheet mica has not yet been produced.

From the clay beneficiation plants about 10,000 tons of dry-ground mica was recovered and marketed. New equipment was installed in two of the plants to boost the percentage of mica recovery. This consisted principally

Slate quarries operated at near capacity levels almost all year

of rod-mills and Humphreys spiral concentrators.

Uses for pyrophyllite continued to expand in the refractories field and as a diluent for insecticide dusts.

The plant of Carolina Pyrophyllite Co. at Glendon, N. C. was destroyed in August, 1951 by fire. It is being replaced by a new, modern, fire proof plant that will start operations in early 1952.

RARE EARTHS The U. S. production of monazite increased during 1951 due to larger output in Florida and Idaho. There was also considerable interest in the monazite deposits in North Carolina and South Carolina, but no commercial production. Bastnasite, a rare earth fluocarbonate, was mined and concentrated by Molybdenum Corp. at Mountain Pass, Calif. This operation started in 1951. The use of rare earths in heat-resistant steels passed from the experimental stage into commercial production during 1951, and thus increased the requirements for the rare earths. The use of rare earths in magnesium alloys also increased due to the desirability of these high-strength magnesium alloys in certain jet engine parts.

Tremendous demand for columbium in special alloys and in certain grades of stainless steel caused columbite to rise to the top of the list of strategic minerals. The U. S. Government attempted in various ways to increase the supply by encouraging new domestic and foreign production. U. S. production was increased substantially late in the year when the Foote Mineral Co. began to recover less than one ton per month from pegmatites near Kings Mountain, N. C.

Early in 1951 the same company announced the first production of pure hafnium metal, an element with properties similar to zirconium. Hafnium is found in varying amounts in all zirconium ores.

REFRACTORIES The heavy demand for refractory raw materials continued and various programs to alleviate shortages and improve quality are in action. The heavy media separation process has been applied to Austrian magnesite and Philippine chrome ore.

There was further deterioration of the kyanite situation particularly that from India with supply becoming shorter and prices higher. This situation has resulted in greater activity in the production of synthetic grog to replace the traditional Indian kyanite. The basis for the synthetic grog is available raw materials alone or in combination such as bauxite, domestic kyanite, bauxite and clay, alumina and clay.

Depletion of the diaspore deposits in Missouri continued at a rapid rate. Positive steps were taken to increase the supply of calcined South American bauxite of the type useful for high alumina refractories. An additional rotary kiln should be operating by April 1952.

New sources of raw material for the manufacture of silica brick were investigated and proven, notably in Pennsylvania and Ohio.

There has been a resumption in the use of higher quality refractories by the principal consuming industries in order to insure uninterrupted services of furnaces. This trend started in the middle 1940's and while some of the programs were discontinued after World War II, a fair number of the practices continued. The current increased use is therefore based on the earlier appreciation of the advantages of using a number of different refractories of specialized properties in order to secure fairly uniform life from all parts of a furnace and the insurance against unexpected interruptions with attendant loss in production rate of the entire shop.

There has been a continuation in the increased use of castable and plastic refractories arising principally from the ease of installation and the development of improved castable refractories with insulating properties.

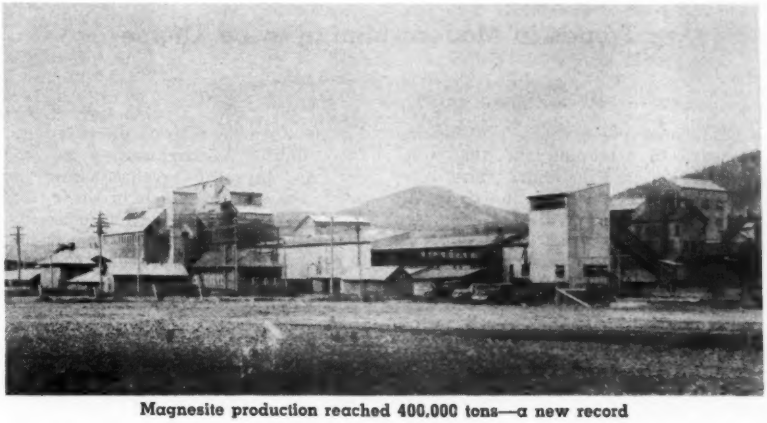
STRONTIUM There were no new developments during the year. There was apparently no domestic production of strontium ore, and imports came almost entirely from Great Britain and Mexico. The two importers and consumers of strontium ore continue to be the Du Pont Co. and Foote Mineral Co. (Both produce strontium chemicals.)

SILICA Silica production in 1951 was 10 to 20 percent above 1950 in most districts. These gains are the result of steady demands from normal, peacetime industries, in conjunction with accelerated defense industry requirements.

Those industries which consumed greater than normal quantities of silica products during the year included: steel foundries; flat glass; airplane manufacture and parts; paints; the electrical industry; and the chemical industry. Those uses which during the year counted for approximately normal quantities of silica included: building materials; automobiles and parts; ceramics; glass containers; railroads; soaps and detergents.

New uses for silica products during the year included additional building material items; molded products; the resin-silica Croning or shell process for making fine foundry molds and cores, in which phenolic resins are used in conjunction with fine silica; and greater development of silicone products.

No new silica deposits of significance were developed during the year. There were, however, numerous plant extensions and improvements accomplished in nearly all localities, including improved mining equipment, greater grinding capacity, and extensions in drying, refining, screening, and classifying equipment. The principal producing areas continue to be the states of Illinois, Pennsylvania, Ohio, New Jersey, and Missouri.



Magnesite production reached 400,000 tons—a new record

STONE INDUSTRIES Sand and gravel and crushed stone output attained new peaks. For the first 10 months of the year sand and gravel producers reported a 6-percent increase in output over the corresponding period of 1950, and crushed stone production was up approximately 13 percent. Total production for the year amounted to an estimated 392,000,000 tons of sand and gravel, and 283,000,000 tons of crushed stone.

Several new medium sized plants were established to provide aggregate where defense installations increased demand. Rising transportation costs made it desirable to locate these plants as near the market as possible. This trend and a gradual improvement in the efficiency and reliability of medium sized equipment promoted the use

(*Continued on page* 146)

Cincinnati—a view from across the Ohio River

1952 Coal Convention—May 5-7

Trends in Modern Mining to be Theme

COAL men everywhere are looking forward to attending the 1952 Coal Convention in Cincinnati, Ohio, May 5-7. Here they will gather from all parts of our land to benefit from the experiences, trials and experiments of others within the industry. Those in attendance will be there to learn about new methods and machines and new uses of familiar methods and equipment. They have been given a goal—600,000,000 tons in 1952, one billion tons in 1975—and the knowledge gained at this meeting will be instrumental in the attainment of this goal.

Theme of the Convention will be the trends in modern mining and sessions will cover developments under way and in prospect that are designed to further the efficiency and safety of coal mining operations. Considering the progress that is being made and the long list of new developments, the selection of subjects for the program was largely a matter of elimination. There are so many new things materially contributing to the advancement of mining, that many which had only a narrow field of application had to be omitted in favor of those with broadest appeal.

In keeping with the trend of modern mining, the Program Committee endeavored to look ahead and anticipate coming events. Among the subjects selected are descriptions of machines and practices, experimental at present, but with great possibilities for the future. One of these is longface mining, recognized since the earliest days of mechanization as being the system which in theory offers the highest operating efficiency for machines. Longface operations, in general, have not proven successful in this country. However, there has been a recent revival of interest in this system due to successful adaptations in Europe. Several mines in the United States are now experimenting with European designed equipment and will be described in convention papers.

Other new practices such as roof bolting and continuous mining will be the subjects of papers describing equipment, operating methods and results. The more conventional underground and surface equipment and techniques will be given thorough coverage to bring out recent improvements designed to promote highest operating efficiency.

Entertainment Planned

Special luncheons will be held on Monday and Tuesday, where prominent guests from government and industry will speak on problems close to the heart of the coal mining industry. The traditional Coal Miners' Party is planned for Monday evening, a time for fun and relaxation with the great fraternity of coal miners and their ladies.

Climax of the Convention will be the Annual Banquet on Wednesday evening. This speechless dinner will wind up the busy days of the week and highlight the coal mining year. After a brief introduction of honored guests, top-notch talent will provide entertainment for the evening. Tickets for the banquet and luncheons may be ordered in advance.

Following custom, registration forms will be distributed in mid-March throughout the industry—to both operators and manufacturers—requesting lists of those who will attend. Hand-lettered badges will be prepared and forwarded in mid-April.

Make Reservations Now

All room reservations are to be made directly with the hotels. Those planning to attend should place their reservations at once. The Cincinnati Convention and Visitors Bureau, Inc., Dixie Terminal Bldg., Cincinnati 2, Ohio, (telephone—Parkway 3728) will assist in securing accommodations if desired. Perhaps a phone call now would be wise.

Attend the 1952 Coal Convention—the outstanding annual event of the coal mining industry. A look at the opposite page will show that a well balanced program has been arranged, one that appeals to both operator and executive.

Not only are coal men looking forward to going to Cincinnati, but Cincinnati is looking forward to having them. The carpet will be rolled out and every effort made to assure that one and all will enjoy the stay in the Queen City.

Preliminary Program

MONDAY, MAY 5

10:00 am—Opening Session

New Developments for Coal Utilization

JOSEPH PURSGLOVE, JR., Vice-Pres., Pittsburgh Consolidation Coal Co., Pittsburgh

Materials and Machinery for Coal Mines

CHARLES W. CONNOR, Administrator, Defense Solid Fuels Administration

EDWARD T. KLETT, Deputy Administrator, Defense Solid Fuels Administration

HAROLD A. MONTAG, Dir., Mining Machinery Div., National Production Authority

12:15 pm—Luncheon

Guest Speaker—To be announced.

2:15 pm—Roof Support Session

Wet and Dry Roof Drilling

C. E. LINKOUS, Dir. of Safety, Island Creek Coal Co., Holden, W. Va.

L. F. LUMAGHI, JR., Pres., Lumaghi Coal Co., St. Louis

Roof Bolting in Pillar Recovery

JAMES L. GILLEY, Engr., U. S. Bureau of Mines, Mt. Hope, W. Va.

Overall Economies of Roof Bolting

DONALD B. SHUPE, Supt., Eastern Gas & Fuel Associates, Kimball, W. Va.

2:15 pm—Strip Mining Session

Overburden Blasting Techniques

JOHN L. ROMIG, Asst. Mgr., Technical Division, Atlas Powder Co., Wilmington, Del.

Road Construction and Maintenance

S. F. SHERWOOD, Gen. Mgr., Central Indiana Coal Co., Indianapolis, Ind.

Progress of Rotary Drilling

J. S. HARMON, Gen. Supt. of Stripping, Hanna Coal Co., St. Clairsville, Ohio

TALHURST BUTLER, Central Pennsylvania Quarry Stripping & Construction Co., Hazleton, Pa.

TUESDAY, MAY 6

10:00 am—New Developments Session

Breaking Coal at Face with Chemechol

R. D. HEDREEN, Asst. Mgr., Sales Office, E. I. du Pont de Nemours & Co., Chicago

Longface Mechanical Mining

A panel of coal operators will describe their experiments using European-designed equipment

Auger Mining Underground

Speaker to be announced

10:00 am—Underground Haulage Session

Slope Sinking at Peabody No. 10 Mine

By a representative of Peabody Coal Co., Chicago

Modern Underground Rail Haulage Systems

WALTER E. KIRKWOOD, Chf. Insp., Tennessee Coal & Iron Div., U. S. Steel Co., Fairfield, Ala.

B. M. NEEL, Asst. Gen. Supt., Stonega Coke & Coal Co., Big Stone Gap, Va.

Belt Installation, Maintenance and Repair

W. A. HASLAM, Asst. to Vice-Pres., The New River Co., Mt. Hope, W. Va.

A. E. LONG, Gen. Supt., Clearfield Bituminous Coal Corp., Indiana, Pa.

12:15 pm—Luncheon

Guest Speaker—DR. KENNETH MCFARLAND, Educational Consultant, General Motors Corporation

2:15 pm—Continuous Mining Session

Progress Review of Continuous Mining

A panel of coal operators will present a symposium covering experiences with various types of machines, giving operating details such as mining plan, service haulage, size consist, dust control, etc.

Pillar Extraction with Continuous Machines

J. A. YOUNKINS, Asst. Gen. Supt., Duquesne Light Co., Pittsburgh

2:15 pm—Strip Mining Session

Strip Methods in High Overburden

A. F. LEE, District Engr., Truax-Traer Coal Co., Pinckneyville, Ill.

PAUL GODDARD, Vice-Pres., Carey, Baxter & Kennedy, Plymouth, Pa.

Stripped Land Rehabilitation

FRANK J. FORESMAN, Personnel Director, Pittsburg, & Midway Coal Mining Co., Pittsburg, Kansas

Stripped Land Use Developments

THOS. C. CHEASLEY, Chairman, A. M. C., Land Use Technical Committee

WEDNESDAY, MAY 7

10:00 am—Power and Maintenance Session

Modern Lubrication Practices

R. M. JOHNSON, Vice-Pres., Blue Bird Mining Co., Hazard, Ky.

HAROLD LOWRY, Maint. Engr., Snow Hill Coal Corp., Terre Haute, Ind.

Underground Power Transmission

By a representative of Union Pacific Coal Co., Rock Springs, Wyo.

Maintenance for a Continuous Mining Section

J. J. SNURE, Production Mgr., and

G. W. STUMP, Asst. Production Mgr., Rochester & Pittsburgh Coal Co., Indiana, Pa.

10:00 am—Safety Session

Fire Prevention for Belt Conveyors

C. W. THOMPSON, Mgr., National Mines Corp., Morgantown, W. Va.

Man Trips for Track and Belt Haulage

DON CONOWAY, Engr., Robinson and Robinson, Charleston, W. Va.

F. F. STEWART, Supt., Jewell Ridge Coal Corp., Tilford, Ky.

Coal Dust Control Underground

R. EMMET DOHERTY, Engr., Anthracite Institute, Wilkes-Barre, Pa.

2:15 pm—Coal Preparation Session

Heated Cloth Screening

JOHN E. DUNN, Processing Machinery Dept., Allis-Chalmers Mfg. Co., Milwaukee

MILO W. SUMMERS, Vice-Pres., Westmoreland Coal Co., Madison, W. Va.

Water Clarification and Sludge Recovery

JAMES P. BLAIR, Coal Prep. Engr., Heyl & Patterson, Inc., Pittsburgh

Dense Media Separation by Tromp Process

J. W. MACDONALD, Chief Engr., Old Ben Coal Corp., Christopher, Ill.

7:00 pm—Annual Banquet

With the Defense Agencies

By HARRY L. MOFFETT

REPORTING to the nation on the status of the mobilization program, Charles E. Wilson states that we have now reached the period of "severest pinch" in the allocation of materials to the civilian economy and that the pinch will continue into 1953. He reports that the United States has reached a rate of $2 billion a month in military deliveries, but cautions that the rearmament period may be more protracted than generally realized.

DMPA Organization Announced

Meanwhile, the Defense Materials Procurement Agency, gearing itself to the task of increasing metal and mineral production, has announced its formal organization. A chart showing this organization appears on page 141.

Named to key posts in DMPA were James Douglas as assistant deputy administrator; Tom Lyon, director of the Domestic Expansion Division; Charles E. Stott, director of the Foreign Expansion Division; Harold A. Montag, director of the Mining Requirements Division; John G. Ford, acting director of the Contract Negotiations Division; and A. B. Parsons acting director of the Program Development Division. Montag will continue to serve also as director of NPA's Mining Machinery Division.

Douglas will work with DMPA deputy administrator Howard I. Young in coordinating the functions of the operating divisions.

DMPA administrator Jess Larson has also named Robert S. Palmer, executive director of the Colorado Mining Association, as a consultant to the agency on mining conditions in the Western States.

The top minerals agency has further announced an agreement with Calumet and Hecla Consolidated Copper Co. providing for the payment of over-the-ceiling prices to maintain the current level of output from the company's Iroquois, No. 4 Kearsage, Peninsula, and Allouez No. 3 mines. DMPA will pay the difference between the ceiling price of 24⅝ cents per pound for lake copper and prices ranging from 29.6 cents a pound to 31 cents a pound depending on the mine involved. This is the first agreement of its type and is designed to prevent the shutting down of the operations involved. The agency is also expected to enter into a long-term contract with White Pine Copper Co. at over-the-ceiling prices.

DMPA has also been giving the claimant functions for maintenance, repair and operating supplies and the allocating powers over metals and minerals previously assigned to the Defense Minerals Administration.

DSFA Sets New Deadline for CMP Applications

The Defense Solid Fuels Administration has set new closing dates for more than 8000 solid fuels producers to file applications for allotments of controlled materials. The new deadline for filing CMP-4C applications in each case is before midnight of the 15th day of the fourth month preceding the quarter for which the delivery of controlled materials is scheduled.

DSFA administrator Connor said that earlier filing of these applications will assist the agency in substantiating to DPA its estimates of the requirements of the solid fuels industry's requirements for controlled materials.

Connor also has predicted that 600 million tons of coal will be produced in 1952, an increase of 24 million tons over 1951 totals.

CMP Second Quarter Allotments Announced

DPA has announced second quarter allotments of controlled materials which reflect a general 10 percent cut in the consumer durables field.

The following allotments of interest to the mining industry were made: *Defense Minerals Administration* (now in DMPA)—steel, 39,250 tons; copper and copper base alloys, 1,605,000 lbs.; aluminum, 340,000 lbs.; *Defense Solid Fuels Administration*—for coal mine construction—steel, 12,790 tons; copper and copper base alloys, 259,000 lbs.; aluminum, 19,000 lbs.; for coke oven construction—steel, 26,710 tons; copper and copper base alloys, 321,000 lbs.; aluminum, 2,000 lbs.; and *NPA's Mining Machinery Division*—steel, 135,518 tons; copper and copper-base alloys, 3,769,000 lbs.; and aluminum, 269,000 lbs.

Meanwhile, NPA has urged all applicants for priorities, allocation materials and other types of assistance to file their requests for such aid in triplicate. This procedure, NPA said, will expedite processing of applications.

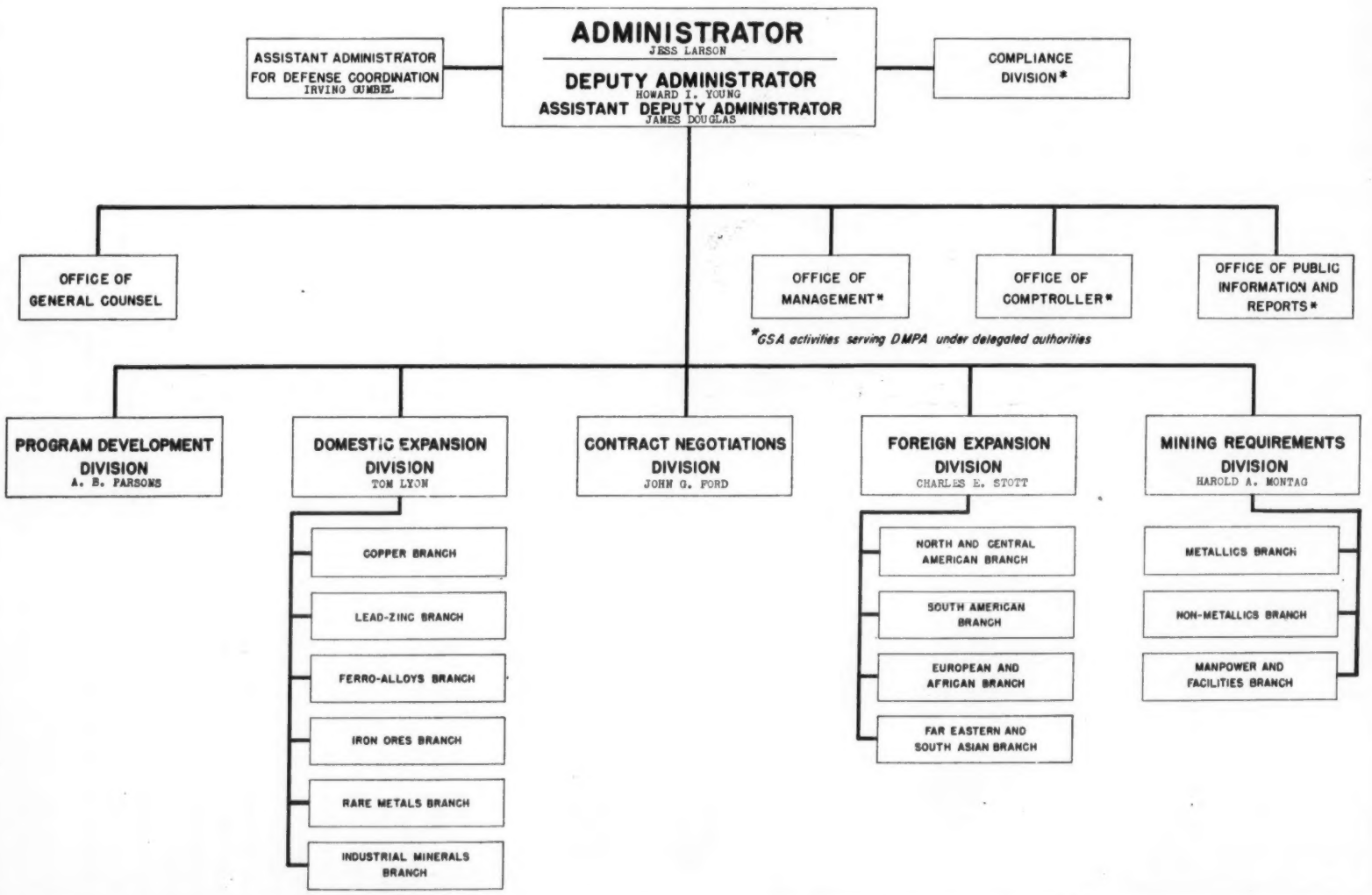
OPS Revises Metal Prices

The Office of Price Stabilization has authorized a 2-cents per pound increase in the price ceilings for domestic lead and zinc ores and concentrates, retroactive to October 2, 1951.

The price increase was made retroactive to protect producers who assumed that a price ceiling boost of 2 cents a pound made October 2, 1951, on primary lead and slab zinc, had likewise applied to ores and concentrates. OPS said that this was its intention but the agency failed to spell it out in the October 2 order.

Meanwhile, defense mobilizer Charles E. Wilson has declared that there will be no increase in the price ceilings of primary copper produced in the U. S. or in the price of copper scrap.

DEFENSE MATERIALS PROCUREMENT AGENCY



COAL PUTS THE PLENTY IN THIS *LAND OF PLENTY!*

Thanks to coal, America has plenty of refrigerators, stoves, autos, even TV sets, for coal is essential in making the steel that goes into them. America gets electricity-a-plenty—thanks again to coal, which supplies our utilities with 70% of their fuel. And most of this nation's great plenty of fine products is made in factories that use *bituminous* coal for power!

Coal will continue to supply all the heat, light and power America needs. Of America's entire fuel reserves, 92% is coal and America's mines are the most efficient in the world!

Are you responsible for choosing a fuel to generate power in a factory—to heat a home or other building? Then think of the many advantages of *bituminous* coal!

DOWN-TO-EARTH FACTS ABOUT COAL!

- Lowest-priced fuel almost everywhere!
- Labor costs are cut with modern boilers and automatic handling equipment!
- Easiest and safest to store *of all fuels!*
- America's vast reserves make coal's supply always dependable!
- Dependable supply assures price stability!
- A progressive industry strives constantly to deliver an ever better product at the lowest possible price!

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

FOR ECONOMY AND DEPENDABILITY

YOU CAN COUNT ON COAL!

Wheels of GOVERNMENT

AMC

As Viewed by A. W. DICKINSON of the American Mining Congress

THE Congress now has received the President's three messages on "State of the Union," Economic Report and the Budget. Emphasis in the initial message was placed on Government encouragement of exploration for new mineral deposits. Both the Economic and Budget messages called for an additional $4.6 billion in taxes to supplement an $85.4 billion budget, of which $51 billion would be for the military.

In addition to the request for more revenues, the President's legislative program asks: (1) a two-year renewal of the Defense Production Act; (2) military and economic aid to free nations; (3) funds for the Small Defense Plants Administration; (4) St. Lawrence Seaway and Power Project; (5) housing and community facilities in defense areas; (6) amendment of the Taft-Hartley Act; (7) agricultural price support; (8) power for Federal Reserve System to impost additional bank reserve requirements, and authority to control trading margins; (9) increased old age and survivors' insurance payments, and strengthening Federal unemployment insurance system; (10) Federal aid to education; and (11) Federal aid for medical education and local public health services.

Tax

The current repetition of the President's call for closing tax "loopholes" was pointed up by his Council of Economic Advisors in their Annual Economic Review. Referring to various "revenue-losing" features of the 1951 Act, the Council called attention to White House criticism of "excessively liberal capital gains provisions, family partnerships, and excessive depletion allowances on oil and gas and certain mineral properties."

This loophole talk aroused Senator Tom Connally of Texas, ranking majority member of the Senate Committee on Finance, who declared that he does not agree at all with the President's view that the depletion allowances constitute a loophole—that depletion allowances are wise and just provisions without which not only the producer but also the consumer will suffer.

Leading members of both parties in House and Senate have declared against increasing taxes and are urging reductions in appropriations to balance the budget. It is indicated that consideration of any revenue legislation will be deferred until after March 15, at which time the House Committee on Ways and Means may consent to hear a presentation of the Treasury's views.

Renegotiation

Early in January the proposed regulations under the Renegotiation Act of 1951 were made public. Recommendations for appropriate changes by interested persons are under consideration by the Renegotiation Board and announcement of the form under which the Board will function is expected February 15.

The regulations cover Section 106 (a)(3) of the Act, which exempts "any contract or subcontract for the product of a mine, oil or gas well, or other mineral or natural deposit, or timber, which has not been processed, refined, or treated beyond the first form or state suitable for industrial use."

The Board has defined the words "other mineral or natural deposit," as including only minerals or natural deposits of a wasting or depletable character similar to the products of a mine, oil or gas well. It is also stated that, in general, a product will be exempted until it has arrived at its dispersal point, where a substantial portion of the product is used by the ultimate consumer, or by industries other than the industry of origin.

Stockpiling

The national defense stockpile inventory as valued by the President in his budget message, stood at $3.3 billion on October 31, 1951. The message predicted that by the end of the 1953 fiscal year the value of the stockpile will reach $5 billion, with an additional $1.7 billion under contract for later delivery. The message recommended $155 million in new obligational authority for stockpiling in the next fiscal year, $435 million less than Congress authorized for the current fiscal year. The President stated that this decrease is due to (1) additional expansion of supply being financed from the Defense Production Act borrowing authority, thereby reducing long term contracts under the stockpile authority, and (2) the lessening quality of materials available for stockpiling in 1952 as a result of increased military consumption and expansion of production capacity. Expenditures for stockpiling in fiscal 1953 are placed at $1.1 billion as compared to $800 million in 1952.

Metal Duties

The Senate has passed and returned to the House for concurrence two bills which would suspend the import duties on lead and zinc until March 31, 1953. The lead bill calls for reimposition of the duty in the event the price of lead falls below 18 cents a pound for any one calendar month. The same is true of the zinc bill, which was amended to cover only zinc ores, and zinc in blocks, pigs, and slabs.

Early House concurrence and White House approval are anticipated.

★ ★ ★ ★ ★ ★ ★ Washington Highlights

CONGRESS: Analyzing White House messages.

TAX: No increase anticipated.

RENEGOTIATION: Regulations pending.

STOCKPILING: Inventory at $3.5.

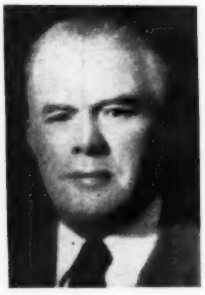
TARIFF: Lead and zinc duties suspended.

★ ★ ★ ★ ★ ★ ★

AMC Personals

Election of **Louis Buchman** as vice-president and director of Kennecott Copper Corp. was recently announced by Charles R. Cox, president.

Buchman has been associated with Kennecott interests since 1914. After holding various positions with Utah Copper Co., a predecessor of Kennecott Copper, in 1930 he was appointed superintendent of the open pit mine in Bingham Canyon, Utah. He held that position until 1946 when he was appointed general superintendent of all operations of Kennecott's Utah Copper Division. On January 1, 1949 he was appointed general manager, Utah Copper Division, and on October 1, 1949 he was named general manager of Kennecott's Western Mining Divisions.



John J. Shipherd has been elected president and director of the Delaware, Lackawanna and Western Coal Co. to succeed the late Mr. Edward Griffith. Shipherd had previously been elected president of the following wholly owned subsidiary companies: Household Fuel Corp., The D. L. & W. Coal Co. of Canada, Ltd., and Household Fuel Co., Ltd.

Secretary of Commerce Charles Sawyer has announced the appointment of **Henry H. Fowler** as administrator of the National Production Authority. Fowler succeeds Manly Fleischmann, who resigned to devote his full attention to his post as administrator of the Defense Procurement Agency.

Dr. Robert F. Mehl, director of the Carnegie Institute of Technology's Metals Research Laboratory and head of the Metallurgical Engineering Department, spent January in Brazil as head of a commission of the Technical Cooperative Administration (President Truman's Point Four Program) under the auspices of the Department of State.

One of the world's leading authorities in Metallurgy, Dr. Mehl studied the possibilities of the development of the iron and steel industry and the profession of metallurgy while headquartered in Rio de Janeiro.

Eric H. Reichl, research manager of Pittsburgh Consolidation Coal Co.'s Research & Development Division, left in mid-January to spend two months in Europe. He will observe developments in coal processing, in the production of high-btu gas directly from coal and in the making of synthetic liquid fuels.

Paul Zinner, regional director of Region V at Minneapolis, Minn., has been named chief of the Minerals Division of the U. S. Bureau of Mines in Washington, succeeding **Lowell B. Moon**, who recently resigned to accept a position with Kennecott Copper Corp. Zinner has been replaced by **Paul T. Allsman**, formerly with the Denver office of the Bureau.

J. B. Morrow retired from the board of directors of Pittsburgh Consolidation Coal Co., effective February 1. He has been a director of the coal company since it was formed in 1945, and retired from the company as first vice-president last April.

On February 15, Morrow and N. G. Alford formed the independent engineering consulting firm of Alford, Morrow & Associates, as successors to Newell G. Alford & Associates.

The new consulting firm will specialize in coal mining and preparation, property valuations, in prospecting, development and mapping work for the mining industry.

Appointment of **M. A. Kuryla**, former industrial relations engineer, to the position of industrial relations manager, western division, United States Smelting Refining and Mining Co., was announced recently by W. C. Page, vice-president and general manager of western operations.

Lee D. Siniff, mechanical and electrical engineer for Consolidation Coal Co. (Ky.) has been granted a leave of absence for one year to accept a temporary position with Eti Bank, Ankara, Turkey. E. C. A. requested his services in connection with its aid program in Turkish coal mines.

Ralph L. Wilcox, chief of the Non-Ferrous Metals Branch of the Economic Cooperation Administration since September 1948, joined the sales department of the American Smelting and Refining Co. in an executive capacity January 1, according to a recent announcement. Wilcox recently served as U. S. representative and advisor to the Manganese-Nickel-Cobalt and Copper-Zinc-Lead Committees of the International Materials Conference.

Announcement has been made of the promotion of **A. Q. Lundquist** to assistant general superintendent of Colorado operations for United States Vanadium Co., a Division of Union Carbide and Carbon Corp.

A. Q. Lundquist

At the same time, it was announced that **J. F. Brenton** has been promoted from plant superintendent of the Company's Rifle, Colo., plant to superintendent of plants for the Colorado area. **R. D. Van Zante** succeeds him as plant superintendent at Rifle.

Edward G. Fox, president of The Philadelphia and Reading Coal and Iron Co., was elected chairman of the Anthracite Operators' Wage Agreement Committee recently. He fills the vacancy created by the death of Mr. Edward Griffith, former president of the Glen Alden Coal Co.

Roy Hatch has retired from his position as assistant general manager of the Utah Copper Division, Kennecott Copper Corp.

Dr. H. J. Rose, vice-president and director of research of Bituminous Coal Research, Inc., has announced that **Henry H. Russell** has been employed as a development engineer on the Pittsburgh staff of the national research agency of the bituminous coal industry. Russell will be primarily concerned with improving coal utilization.

Arthur W. Storm, formerly instructor in mechanical engineering, University of Minnesota, is now with the mechanical engineering department of the Erie Mining Co.

Forbes K. Wilson has been appointed manager of mineral exploration for Freeport Sulphur Co., Langbourne M. Williams, Jr., president, announced.

A graduate of Yale in mining engineering, Wilson was associated with Braden Copper Co. and later managed several gold mines in Columbia before joining the Freeport organization in 1942. Between 1943 and 1947, Wilson served as administrative manager and later as assistant general manager at the company's Cuban subsidiary, Nicaro Nickel Co.

The Board of Directors of Clinchfield Coal Corp. has announced the election of **J. P. Routh,** chairman of the board, to the post of president of the company. The vacancy was caused by the recent resignation of **A. R. Matthews,** now president of Pocahontas Fuel Co., Inc.

W. J. O'Connor, Sr., former Utah Department manager, American Smelting and Refining Co., has been elected president and general manager of the Independent Coal and Coke Co., Salt Lake City.

The American Institute of Mining & Metallurgical Engineers, Inc. recently announced the appointment of **John V. Beall** as manager of publications, effective February 1, following the resignation of T. E. Lloyd. Beall has served in various editorial positions and as eastern secretary of the Mining Branch of the Institute during the past four years, becoming editor of *Mining Engineering* magazine in 1949. In his new post he will retain the editorship of this publication as well as managing the *Journal of Metals, AIME Transactions,* publication of annual volumes, and other special publications of the Institute.

The Research and Development Division of Pittsburgh Consolidation Coal Co. has announced the appointment of **Wm. F. Saalbach** as adviser on personnel and employment.

Among Saalbach's duties for Pittsburgh Consolidation Coal's research organization will be the visiting of universities and graduate schools in search of technical talent.

Thomas N. Peck, director of the aluminum alloy division of Vanadium Corp. of America, has been appointed deputy director of the aluminum and magnesium division of the National Production Authority, United States Department of Commerce, it was announced recently by NPA Administrator Manly Fleischmann. Peck, who has been granted leave by Vanadium Corp., succeeds **Timothy A. Lynch** who has been designated director of the aluminum and magnesium division of NPA.

— *Obituaries* —

ALBERT F. WOLBERT
AN APPRECIATION BY
WORTHEN BRADLEY

Albert Foster Wolbert, 57, a Bradley Mining Co. superintendent, passed away from a heart attack at his home at the Sulphur Bank Mine, near Clearlake Oaks, Calif., on January 4, 1952.

Born in Baltimore, Md., in 1894, Al and his mother followed his Army officer father on tours of duty, which included a stay in Honolulu. He was graduated from St. Matthews Academy, south of San Francisco, in 1913, and went to work for the California Ore Testing Co. in San Francisco. In 1915 he was transferred to the Atolia Mining Co. as assistant superintendent of their tungsten mine in San Bernardino County, Calif.

Army service in World War I interrupted Al's career from 1918 to 1922, when he returned to Atolia as general superintendent. In 1923 he started open pit work in Atolia's famous "spud patch" deposit of coarse placer scheelite. In 1927 he was again transferred, this time to the Sulphur Bank quicksilver property.

Here he settled down and finished out his life's work. The early years there were arduous and were beset with many problems. These were multiplied by the increased development and production pace demanded by the World War II period. Al's "know-how" in the open pit field was augmented by tours of inspection.

These busy years were followed by more quiet times, during which Al was able to devote more time to his home on Clear Lake, and to gardening. He also intensified his community efforts, including a closely contested but unsuccessful bid for a post as county supervisor.

Physically and emotionally, 1951 was a rough year for Al. Both he and Mrs. Wolbert suffered severe heart attacks in the spring. Later she succumbed to a second attack. Her death and also the death of his father were two blows from which Al never recovered and he too passed on.

His many friends and associates are finding it hard to believe that stout, jovial, popular "Al" Wolbert has departed from their midst.

Oscar A. Dingman, 62, professor of mining, Montana School of Mines, at Butte, died December 16 at Missoula, Mont. He was president of the Montana Society of Engineers and a member of the Butte School board. After working with several mining companies Mr. Dingman began teaching at the School of Mines in 1927. He authored bulletins and technical papers which circulated widely in the mining field.

Harry Wilson Marsh, Jr., 27, died December 20 at Boise, Idaho. He was the son of Harry W. Marsh, secretary of the Idaho mining association. He is survived by his parents and a sister.

Raymond C. Gaugler, 59, president of American Cyanamid Co., died at his home in Larchmont, N. Y., January 11.

Born in Pittsburgh, Pa., Mr. Gaugler received his education at parochial schools in that city, and at Duquesne University. Before joining the Cyanamid organization, he was with the United States Aluminum Co. and the Northern Aluminum Company, Canada. Mr. Gaugler, who had been with Cyanamid since 1917, served as assistant treasurer and comptroller, and was named treasurer in 1929. In 1939, he became vice-president in charge of finance; in 1947, executive vice-president. He was elected president January 5, 1951, succeeding the late W. B. Bell. Mr. Gaugler had been a director of Cyanamid since 1929.

Albert L. Toenges, principal coal mining engineer and chief, Bituminous Coal Mining Section, Fuels Technology Division, Region VIII, Bureau of Mines, Pittsburgh, passed away at his home in the Pleasant Hills district of Pittsburgh, Pa., recently, after several months' illness.

Industrial Minerals

(*Continued from page* 137)

of semi-portable plants with capacities of 100 to 200 tph.

There was an increased use of carbide bits in drilling abrasive rocks. Greater use of wagon drills for primary breaking was made possible by this development.

Most plants ran at capacity most of the time and volume was probably 10 to 20 percent higher than in any previous year.

SLATE Operations during 1951 in the Vermont, New York, Maine, Pennsylvania, and Virginia slate districts were carried on at near capacity levels. Some softening was experienced during the latter months of the year due to the Government imposed restrictions on certain types of building construction. Prospects for the coming year are questionable for the same reason.

Higher freight rates have made it increasingly difficult for slate to compete with substitute locally-made materials and as a result slate is losing out in many areas where the high cost of freight has made its use almost prohibitive for use as roofing material.

During 1951 the Brownville, Me., district has come back into production on slate roofing. This district has been idle for many years.

Production of slate flagstone in natural colors continued to increase for the third consecutive year. This material is receiving wide acceptance for the installation of colorful terraces and patios.

Depletion allowance of 5 percent for slate was included in the Revenue Act of 1951. This should give the industry some much needed tax relief.

In the Vermont district a new plant is being set up to manufacture a bonded slate product made from slate granules and synthetic resins. This plant should be in operation by early spring 1952.

TALC Sales of talc were the highest in history. This is due largely to increases in use for ceramic wall tile, paint, and steatite. The bulk of production in the west was from California, chiefly Death Valley and Owens Valley.

Nevada produced cosmetic talcs from the Palmetto district, Esmeralda County chiefly from the Oasis district, although there were numerous small producers who sold their entire output to the major operators of milling plants.

Blue Star Mines closed its mining and milling operations at Zurich, Calif., during December. Southern California Minerals Co. added a new Reymond milling unit to its plant in Los Angeles. Through its subsidiary, Tri-State Minerals Co., it opened a new mine in Stone Canyon, Mont. This talc is milled at the company's plant in Ogden, Utah.

Sierra Talc & Clay Co. intensively prospected and mined at Johnny Gulch near Ennis, Mont. A power line was built for 21½ miles by Montana Power Co. to serve this mine. A milling plant is in process of construction at Grand Island, Neb.

A new domestic source of steatite talc was brought into production in Montana. Physical and electrical properties of this Montana talc compare favorably with those of California talc, although the resulting product is of somewhat darker color.

Wollastonite, a calcium silicate, has been successfully used as a new raw material in the manufacture of electric insulators and produces a ceramic with exceptionally low dielectric losses and good mechanical strength.

TITANIUM The outstanding developments in 1951 were the completion by Quebec Iron and Titanium Corp. of the first unit of the smelter at Soree, Que., to produce a slag carrying about 70 percent T_1O_2 by the reduction of the titaniferous ore from Lac Tio near Havre St. Pierre, Que.; the acquisition by National Lead Co. of part of the old plant at Henderson, Nev., built for Basic Magnesia Co. and the initiation of construction there of a new plant to produce 10 tons per day of titanium metal; and completion by du Pont of an additional unit of their pilot plant making titanium metal.

Foote Mineral Co. resumed the production and sale of very pure titanium metal by the iodide process, and the Crane Co. began to operate a titanium metal plant late in the year.

The U. S. requirements for ilmenite during 1951 continued at a very high rate, but the supply appeared to be sufficient for current needs. The requirements for rutile in the welding industry and for the production of titanium metal rose during 1951, and the domestic and foreign supplies did not increase as rapidly. Consequently, rutile customers were unable to get their full requirements during the latter part of the year.

ZIRCON The demand for zircon during 1951 was apparently the largest on record, but the supply was adequate, due primarily to increased production in Florida by the Humphreys Gold Corp. Substantial imports continued to come from Australia.

BARGAINS IN USED AND REBUILT EQUIPMENT

LOCOMOTIVES, 250 VOLT DC, BALLBEARING

2—20-ton Jeffrey MH-77
2—15-ton West 908-C
2—15-ton Goodman 36-A
5—15-ton Jeffrey MH-110
4—13-ton G.E. HM-827
2—13-ton Jeffrey MH-110
1—10-ton Jeffrey MH-110
4—10-ton Goodman 34-B
12—8-ton Jeffrey MH-100 with reels
3—8-ton G.E. HM-819 with reels
4—8-ton West. 905-C with reels
4—8-ton G.E. HM-834 with reels
15—6-ton Jeffrey MH-88 with reels
4—6-ton G.E. HM-801 with reels
15—6-ton G.E. Battery Locomotives
5—6-ton Mancha Battery Locomotives
Complete with new Jeffrey steel strip resistances. All have been rebuilt and any part showing any wear was replaced with new.

LOADING MACHINES, 250 VOLT DC

6—14 BU-3PE Joy
4—14-BU-7RBE Joy
6—11-BU Joy
6— 8-BU Joy
10— 7-BU Joy
2—Myers-Whaley No. 3 Automats, practically new
5—460 Goodman
2—360 Goodman
4—260 Goodman
5—L-600 Jeffrey
2—L-500 Jeffrey

SHUTTLE CARS, CABLE REEL TYPE, 250 VOLT DC

4—Joy 42E-16AX
3—Joy 42E-13X
5—Joy 6SC
10—Joy 42D3 with practically new batteries
8—Lee-Norse Koal-Mobile KMC43B, 4-wheel drive, 33" high
12—Lee-Norse Koal-Mobile KMC46B-5

MOTOR GENERATOR SETS—2300/4000 VOLT

1—300 KW West., 275 V 1200 RPM, full automatic switchgear
1—300 KW G. E., 275 V 1200 RPM, full automatic switchgear
4—200 KW G. E., 275 V 1200 RPM, full automatic switchgear
3—150 KW G. E., 275 V 1200 RPM, manual switchgear

ROTARY CONVERTERS—TYPE HCC-6, 2300/4000 VOLT

1—300 KW G. E., 275 V 1200 RPM
4—200 KW G. E., 275 V 1200 RPM
1—100 KW G. E., 275 V 1200 RPM
All complete with switchboards, transformers and all necessary appurtenances.

STEEL MINE CARS

Several lots of Rotary Dump, End Dump, and Drop Bottom Mine Cars for high and low vein mines. Mail us your inquiries. We have them in lots from 100 to 600, track gauges—36"—42"—44".

DC CUTTING MACHINES—250 VOLT

4—Jeffrey 29-U
3—Jeffrey 29-LE
10—Jeffrey 35-BB
4—Jeffrey 35-BC
4—Jeffrey 35-BSC
8—Sullivan 7-B on Joy cats
6—Goodman 512 on Joy cats
12—Goodman 12-AA
15—Goodman 112-AA
3—11-RU Joy-Sullivan

AC CUTTING MACHINES—220/440 VOLT

2—Jeffrey 29-U
1—Jeffrey 24-B
3—Jeffrey 35-BB
1—Jeffrey 35-L
5—Goodman 12G3
5—Goodman 112G3
4—Goodman 112G3A
2—Goodman 112DG3A

BELT CONVEYOR

1—42" Barber-Green 1000' Belt Conveyor complete with 125 HP drive, idlers, channel frame, and all appurtenances.

STEEL TIPPLES AND WASHERS

Several 4-, 5-, and 6-track late type steel Tipples; also Link-Belt, McNally-Norton, and Heavy Media Coal Washers with capacities of 200 and 300 tons per hour; and two McNally-Norton Unit Washers of 100 tons per hour capacity.

ELECTRIC HOISTS

We have all types of Hoists from 100 HP to 1500 HP, suitable for slope, shaft or drift mines. Complete specifications on request.

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COAL MINE *Equipment* SALES COMPANY

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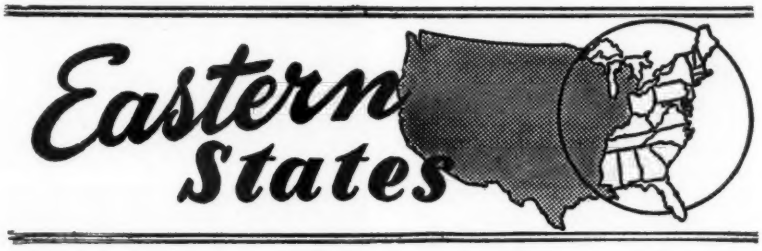
Terre Haute, Indiana



Pump Concentrate 7½ Miles

A 7½-mile pipeline has been completed by The International Nickel Co. of Canada, Ltd. Through it the bulk concentrate from 3,650,000 tons of nickel-copper ore is being pumped annually from the newly-built Creighton concentrator to reduction plants at Copper Cliff.

Part of International Nickel's $130,000,000 program of underground mine expansion, the pipeline has been integrated into an elaborate system which also carries tailings from both Creighton and Copper Cliff to a disposal area midway between the two plants.

The system has 12 miles of trestle, at some points 65 ft high to assure a slope to and from each of the five relay pumping stations so that the concentrate lines will be self-draining in case of power difficulties. All told, 3,000,000 fbm of lumber and 40 miles of wooden pipe were used.

When milling 10,000 tons of nickel-copper ore a day at Creighton, approximately 1800 tons of concentrate and 8200 tons of tailing are produced. Water added to the concentrate makes a pulp which flows through the pipeline at the rate of 800 gpm. The tailing pulp flows at the rate of 2500 gpm.

Despite the rigorous northern winter weather, the complete pumping system has been designed for trouble-free operation. Several times the temperature has dropped to 30° F below zero with no operating difficulties.

Local vs. Local

A National Labor Relations Board Trial Examiner has ruled in the case of one local union of the United Mine Workers of America complaint of unfair labor practices against another local, also of the UMWA. (MINING CONGRESS JOURNAL October, 1951, p. 97) The examiner ruled that the UMWA has no right to insist that Consolidation Coal Co. (Ky.) hire union members who had been laid off at Mine 214 instead of transferring employes from Mine 207, which is being worked out, to Mine 214. The court fight was between the local unions of Mines 214 and 207.

Schroeder Co. Expands

On December 20, 1951, the Schroeder Co., McGregor, Iowa closed a transaction which involved 8000 acres of rich iron ore land at Russellville, Ala. The Schroeder Co. has a washing flotation plant in Russellville to beneficiate the ore which is shipped by rail to the Birmingham steel mills.

Study Mining Courses

On January 11 and 12 a meeting of the Vocational Training and Education Committee of the National Coal Association was held at Lafayette College, Easton, Pa.

Among the subjects discussed was the possibility of a course for coal salesmen. It was the consensus that more instruction should be provided for mine transportation; especially in view of increased use of belts in slopes. It was also suggested that an Advisory Committee was essential at each college offering courses in Mining Engineering. The committee could help keep students and faculty well informed on current mining improvements.

Next meeting of the group will be held at Virginia Polytechnic Institute, Blacksburg, Va.

Coal Mine Changes Hands

Three large coal consumers have merged with Pittsburgh Consolidation Coal Co. to form the Mathies Coal Co. They are National Steel Corp., Steel Co. of Canada, Ltd., and Youngstown Sheet and Tube Co.

The new firm will buy the Mathies Mine, located at Library, Pa., from Pittsburgh Consol, including all mining equipment, 600 acres of surface lands and some 30,000,000 tons of metallurgical coal in the Pittsburgh seam.

Officers of the new company include G. A. Shoemaker, president; D. H. Davis, vice-president; G. W. Kratz, secretary; and H. K. Yontz, treasurer.

Increase Lab. Facilities

Koppers Co., Inc., will embark on an enlarged and more unified program of research, with a major portion of such work centered at Verona, Pa., where new laboratories are now nearing completion, General Brehon Somervell, president, announced recently.

Dr. G. F. D'Alelio, vice-president and manager of Koppers Research Department, revealed some of the plans for the new research center.

He explained that the new Verona center not only will provide enlarged and improved laboratory facilities but is designed to allow extensive pilot plant work to be carried on. One large area will be devoted to pilot plant work in chemicals, another in fuels and a third in the testing and improving of large machinery. In the pilot plant areas, as many as ten miniature industrial plants may be in operation at the same time. One such plant, now planned, will make gasoline and oil from coal through the process known as hydrogeneration.

Study Anthracite Trends

New markets for anthracite and the role that fuel can play in national defense will be the theme of the tenth annual Anthracite Conference to be held May 8 and 9 at Lehigh University, Bethlehem, Pa.

Dr. Robert T. Gallagher, head of the department of mining engineering at Lehigh University, has been named chairman of the conference committee. Raymond C. Johnson, vice-president of the Anthracite Institute, will serve as vice-chairman. Conference sessions will be held in Packard Laboratory on the Lehigh campus.

The conference is designed to bring engineers, educators, operators and retail dealers as well as the general public up to date on the technological progress in Pennsylvania's hard-coal industry. Papers to be presented will cover the most recent theoretical studies and practical developments in the distribution, utilization, economic and hygienic aspects of anthracite.

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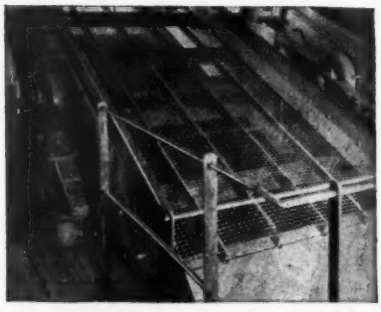

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Alabama Stone Co. Sold

All physical assets of the Rockwood Alabama Stone Co. have been purchased by the Georgia Marble Co. of Tate, Ga. Rockwood Alabama Stone Co., located in Franklin County, Ala., began production in 1884. Present holdings include two limestone mills, more than 1000 acres of land, 118 houses, office buildings, a store, a school, a church and other properties. Announcement of the purchase was made by James R. Cowan, president of the Georgia Marble Co.

Build Cleaning Plant

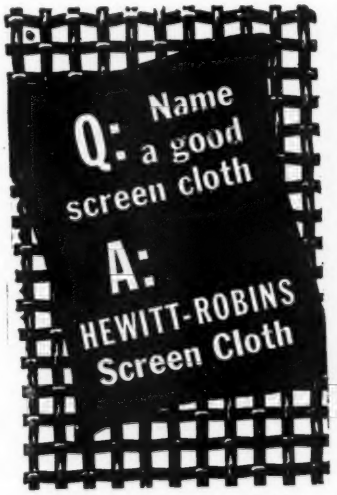
Olga Coal Co. plans to build a 1250-tph coal cleaning plant at its Olga Mine No. 2 near Coalwood, W. Va. A contract to design and equip the Dense Media Process Plant has been awarded to Nelson L. Davis Co. Run-of-mine coal will be fed to a shaker screen and the plus eight-in. material scalped off and hand picked. Crushed 8-in. by 0 raw coal will be delivered to a 4000-ton capacity blending bin from which the coal will pass over a group of presizing screens removing the minus ¼-in. coal which will be used for metallurgical purposes. The 8 by ¼-in. raw coal fraction will then be cleaned in three Dense Media processors. Three-shift mine production will supply the cleaning plant, which will operate two shifts per day.

Facilities will be provided for disposal of washery rejects and the final clean coal will be screened and boom-loaded to cars in five individual coal sizes. Water tanks will be installed to receive the plus ¼-in. coal to remove tramp wood.

Stress Role of Section Boss

The British coal mining industry was urged recently to develop "revolutionary means" of getting coal cheaply to the surface and to fully exploit coal as a raw material. The recommendation was made by a team of 16 British coal mining experts who studied the American coal industry under the productivity and technical assistance program of the Economic Cooperation Administration.

Like all the productivity teams which come to the United States under the ECA program, the British coal group found there was no "secret," no one factor, which makes American industry turn out more at lower cost. They agreed, however, that, "above all," the effectiveness of the best American mine management is due to the development of the section foreman "as the keystone of the supervisory system."



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New Aluminum Source!

Large deposits of aluminum phosphate, offering a possible new source of aluminum, have been discovered by the U. S. Geological Survey according to an announcement by Secretary of the Interior Oscar L. Chapman.

Occurring principally as the mineral wavellite, the deposits were discovered in the Florida land-pebble phosphate field. They occur in a widespread zone immediately above the calcium phosphate deposits which are being mined to make fertilizer. The aluminum phosphate has been discarded as part of the overburden and is in the very fine material which can be concentrated by screening on a 200-mesh screen.

Quarry in Production

After a year of preliminary work Consolidated Cement Corp. is producing crushed limestone from its quarry near Paulding, Ohio. First stripping operations were started in January 1951 and approximately 550,000 cu yd of material were removed from the initial pit, 250 ft wide and 1700 ft long. Limestone from a 50-ft bed will be loaded and shipped to the firm's plant in Cement City, Mich.

Win Management Award

Lehigh Coal & Navigation Co., Philadelphia, and Pittsburgh Consolidation Coal Co., Pittsburgh, have been awarded Certificates of Management Excellence for the year 1951 by the American Institute of Management, New York. According to Jackson Martindell, president of the foundation devoted to the study and improvement of corporate organization and management, only 298 firms in the United States and Canada were deemed eligible to receive the designation.

This is the first time Lehigh Coal & Navigation has received the A. I. M. Award. Pittsburgh Consolidation was on the list of "excellently managed" firms a year ago.

N. C. Metal Mines Open

Two mines in the North Cove section of McDowell County, N. C. have been opened by the Great Western Mining Corp. At one mine the company is working an estimated 360,000-ton manganese deposit. At the second operation just three miles away, the company is mining copper.

Will Dredge Ship Channel

Orinoco Mining Co., subsidiary of United States Steel, has awarded contracts to the Gahagan Overseas Construction Co. and the McWilliams Overseas Dredging Corp. for the dredging and maintenance of a ship channel in Venezuela from the Gulf of Paria to Puerto Ordaz, the railroad terminal to be built on the Orinoco River.

The Macareo and Orinoco Rivers in Venezuela will be dredged wherever necessary to provide a ship channel 170 miles long from the Gulf of Paria to the company's ore docks on the Orinoco River. This channel will permit ocean-going ore carriers of drafts up to 24 ft to proceed up the river to Puerto Ordaz, where they will be loaded with iron ore from the Cerro Bolivar ore deposits for transportation to the United States.

Work has begun and the channel is expected to be completed in two years. Two of the largest American dredges will be engaged on this project, the "Peru" of the Gahagan Co., and the "Caribbean" of the McWilliams Co. Each dredge is able to move about 900,000 cu yd of material a month.

Proposes Minerals Secretary

Rep. Walter S. Baring (D-Nevada) has introduced a bill, H. R. 5964, designed to establish a Minerals Department of the government, and add a new member to the President's Cabinet. The legislation is a move towards separating the entire minerals division from the Department of the Interior.

According to Mr. Baring, the proposed Secretary of Mineral Resources, as provided in his bill, would have the job of seeing that the country had ample minerals of all kinds to keep the economy rolling.

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Awards Survey Contract

A contract for gravimetric survey of Sheffield Iron Mines Ltd. property in Sheffield Township of eastern Ontario has been granted to Mining Geophysics Corp., Ltd., of Toronto, Ont. Work is to include surveying, mapping, etc., preparatory to further development.

Hold Coal Conference

In a new attack on the problems in coal research, the U. S. Bureau of Mines invited a select group of operators to Washington to listen to members of the Bureau's research staff discuss work now under way and considered for the future. The meeting, held January 9 and 10, was conducted by E. D. Gardner, chief mining engineer of the Bureau.

Among projects reviewed were those executed by the Applied Physics Branch, the Coal Mining Research Section, and the Roof Control Section. Also discussed was the work on roof control through centrifugal testing of rock and examination of rock measures, problems on increased recovery from flat coal beds, and mining methods including new revivals of long wall mining now in operation.

Urge Aluminum Study

The prime aluminum products industry committee, at a meeting with NPA, recommended that the Government explore the possibility of bringing into production a privately-owned facility at Baden, N. C., now idle, but with aluminum-producing capacity estimated at 9600 tons per year.

NPA officials said that the high cost of available electric power had made it uneconomical to operate this facility. The committee suggested that every means be examined to provide power for the plant so that its production will not continue to be lost to the mobilization program.

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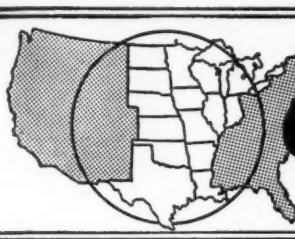

Central States

Shut Down Iron Mine

Wheeling Steel Corp. no longer has any mining operations on the Mesabi Range. In December, Wheeling Steel closed its Wacootah Mine, Mountain Iron, Minn. The Pacific Isle Mining Co. has taken over the mining operations at the Wacootah Mine and all the mine buildings, plant and equipment, together with mineral interests of the Wheeling Co. on the Mesabi Range.

To Develop Briquette Binder

Special equipment of the University of Wyoming's commercial-scale pilot plant has been used recently by Wisconsin scientists to seek methods using spent sulphite liquid as a coal briquette binder. The liquid formerly was discharged into streams. Coal from the Sheboygan, Wis. docks and sulphite liquor from the Sulphite Pulp Manufacturers Research League of Appleton, Wis., are being used in the research at Laramie.

Consolidated Mines Open

Consolidated Mines Co., James V. Reynolds, president, will reopen mines at Wentworth, Mo., early in 1952. Pumping at the mine started January 2. Opening of the Wentworth mines is made possible by a contract with the Mathiessen and Hegeler Zinc Co., of LaSalle, Ill., who will smelt all of the concentrates produced.

The project is primarily one of exploration and development and the company is sinking several shafts to determine availability of the ore. Mining will be marginal, and the ores include sphalerite, carbonate and silicate, with smaller proportions of galena and drybone.

Launch Stone Carrier

The largest self-unloading limestone carrier on the Great Lakes, the steamer *John G. Munson* was launched at Manitowoc, Wis., in late November. The 666-ft coal-burning vessel will join the fleet of the Bradley Transportation Co., a United States Steel subsidiary, early in the 1952 shipping season.

The freighter, which will be used to carry limestone from Calcite, Mich., to lower lake ports, is named in honor of John G. Munson who directed the exploratory operations of the Cerro Bolivar iron ore deposits in Venezuela. It will be the widest cargo vessel on the lakes, with a 72-ft beam and will have a carrying capacity of 20,000 gross tons of stone.

Ore Producers Meet

The 28th annual meeting of the Tri-State Zinc & Lead Ore Producers Association was held on December 28, 1951, in Baxter Springs, Kans. A round-up of state legislation passed during 1951 by Oklahoma, Kansas and Missouri affecting the industry was a feature of the day's program.

Following the meeting a cocktail party and buffet supper was held at which Howard I. Young, deputy administrator of Defense Minerals Procurement Agency, gave a short talk on the future metals supply outlook.

Coal Operators Elect

The 22nd Annual Meeting of the Illinois Coal Operators Association was held recently in Chicago. The following officers were elected: H. A. Treadwell, president; Fred S. Wilkey, secretary; and Thurlow G. Essington, general counsel.

Acquire Lease

The lease of the Gorman mine at Randall, Minn. was acquired from the Pacific Isle Mining Co. by Zontelli Bros. Inc. Pumping operations are under way and ore is being stockpiled for shipment in 1952.

Reynolds Builds Texas Plant

Reynolds Metals Co. is going to build a $42,000,000 alumina plant next to its new aluminum reduction plant now under construction in San Patricio County, Texas. The new plant, with a capacity of about 1000 tons per day, will use bauxite shipped directly from Jamaica, B. W. I.

To be finished by January 1953, the plant will supplement Reynolds alumina plant at Hurricane Creek, Ark. in supplying alumina to the company's reduction plants.

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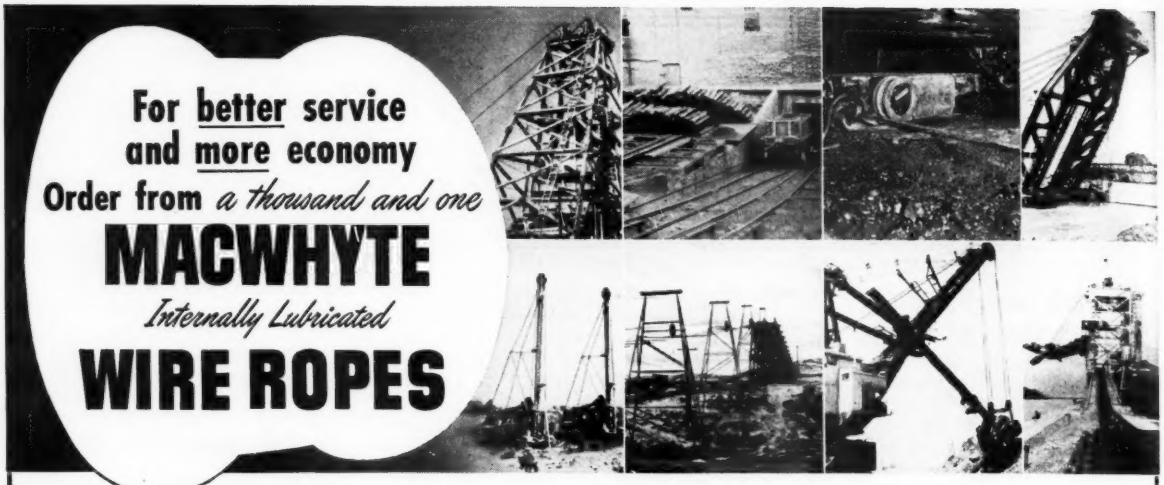

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Lignite Future Great

Dr. Willard D. Pye, chairman of the geology department, North Dakota Agriculture College, stated November 18 that lignite, not oil, will be the cornerstone for conversion of North Dakota from an agricultural to an industrial economy. He stated that North Dakota has enough lignite to keep the entire nation in abundant fuel for generations, if the low grade fuel can be reduced to liquid fuel.

Cement Co. Buys Boat

Most recent to join the list of firms purchasing ocean-going freighters for service on the Great Lakes is the Huron Portland Cement Co., Detroit, Mich.

The company announced in January that it had purchased the 321-ft *Coastal Delegate*, presently carrying miscellaneous cargo between New York and the West Indies. She will continue in that trade under charter to the Bull Line for the next five or six months.

After alterations in the Bethlehem Shipyard at Hoboken, N. J., the freighter will make the long trip through the Mississippi River and the Illinois waterway to begin her cement hauling career in 1953.

Capacity of the vessel will be 6020 tons.

Leadridge Seeks Atom Ore

Amax Athabasca Uranium Mines Ltd. and Aurora Uranium & Gold Mines Ltd. of Toronto, Canada, and Leadridge Mining Co. Ltd. of New York, a subsidiary of the St. Joseph Lead Co. have announced the execution of agreements covering the prospecting and development of the properties controlled by Amax and Aurora located in the Beaver Lodge Lake area in the northwest corner of Saskatchewan, Canada.

Amax and Aurora are the owners of the concessions granted by the Provincial Government which are adjacent to the uranium properties of the Eldorado Mining Co., an agency of the Canadian Government.

The agreement between Amax, Aurora and Leadridge generally provides for the expenditure by Leadridge of substantial sums on each of the two concessions in exploration and development. Options are also granted whereby Leadridge is given the opportunity to acquire working control of both the Amax and Aurora companies. A number of Canadian companies, including Amax and Aurora, have been exploring and developing uranium occurrences in the Beaver Lodge Lake area for the past several years, but this is believed to be the first instance in which one of the major American mining groups has become interested.

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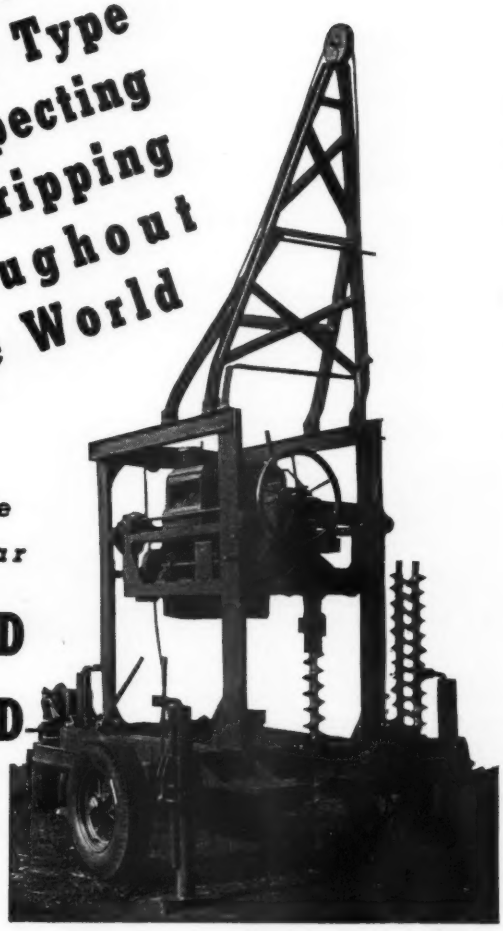

The Parmanco Two-Speed Transmission Drill is designed to meet the requirements of the general prospecting field where it is not necessary to drill in solid limestone. Special sliding frame permits drilling and pulling of augers without moving drill. New design of chuck eliminates all hand operation in raising power plant. Recommended for 50 to 60 feet with four and one-quarter inch equipment. Under favorable conditions it is being used to greater depths and can be used with six inch equipment.

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Clear Rail Route

Right-of-way for the 40-mile railroad to be built for the Reserve Mining Co. is being cleared by the Hunkin-Rundie-Dixon Co. When completed the new railroad will connect Reserve's taconite mining operations at Babbitt, Minn. with a concentrator dock site at Beaver Bay on Lake Superior.

Miners Plant Trees

The Indiana Coal Producers Association has established $1200 a year fellowship at Purdue University for research on forest tree planting. Established to further study of strip land reforestation, the fellowship is but part of a larger fund contributed annually by the Association for work in this field. Over the past 30 years these coal producers have planted some 27,000,000 or more trees on stripped over land.

Scrap Lake Freighter

One of the oldest boats on the lakes, the *E. C. Pope*, will be cut up for scrap for the defense effort. The *Pope* is famed for early and late sailings on the Great Lakes, having opened and closed the navigation season in Buffalo several times. About 1200 tons of scrap is expected to be salvaged from the 317-ft vessel.

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Western States

Lucky Boy Developed

Sunshine Mining Co. and the Coeur d'Alene Silver Giant Corp. have signed a development contract. Sunshine is to develop the Giant's Lucky Boy group of 39 claims in Shoshone County, Idaho, through an extension of the deep crosscut it is putting through Metropolitan holdings on the 3100-ft level. The crosscut has been advanced 6000 ft south from the Sunshine vein.

Alps Group Sold

The Alps group of 36 mining claims along the Spokane, Wash.—Nelson, B. C. highway, owned by a syndicate of which Lloyd Hahn of Spokane is trustee, has now been sold to the Granby Consolidated Mining, Smelting and Power Co. New owners plan to set up a new mining company and develop the properties.

Mercury Mine Changes Hands

Sale of the DeCoursey Mountain mercury mine, believed to be Alaska's largest mercury mine, has been announced. Robert Lyman sold the property to a group of Anchorage men who are presently preparing the mine for operation in the spring. The mine is accessible by a 24-mile trail from Crooked Creek or by a 40-mile trail from Flat in the Kuskokwim area of Alaska.

Work on New Copper Project

Construction is scheduled to start soon on a copper ore concentrating plant at Yerington, Nev., by the Anaconda Copper Mining Co. The plant will handle about 10,000 tons a day. Approximately 500 persons will be employed on the project when the mines and plant are operating.

Richard Newlin, assistant vice-president of the company, described the project "an open pit mining proposition," similar to many of their other operations. The company plans to build the plant itself. Construction will take from one to two years and housing will be provided for both construction and permanent employes. Anaconda owns a large group of claims near Yerington which were extensively explored and diamond drilled a few years ago. The project will be Nevada's second largest copper mining operation.

Subsequent to Anaconda's announcement, Jess Larson, administrator of the Defense Materials Procurement Agency, announced an agreement between the company and the Federal Government assuring a market for the output from Yerington. In return the company has agreed to spend $32,750,000 in developing the property, which has an estimated life of ten and a half years. The project will increase domestic output of copper by more than 30,000 tons annually. During the first two years of operation, 60,000,000 lb a year will be produced. For the remaining years, production will be 66,000,000 lb copper per year. The Government has agreed to pay 25½ cents per lb, f.o.b. midwest markets, for copper which the company is unable to sell to industrial users.

American Zinc Leases Mine

Properties of the Piedmont Mines, Inc., in Cochise County, Ariz., have been leased by American Zinc, Lead and Smelting Co. of St. Louis, Mo. The deal involves approximately 32 claims, known as the Hilltop mine, near Portal, Ariz. The Hilltop was a major producer in 1924-1926, when 5,000,000 lb of lead plus $50,000 in silver were produced. More recently, several cars of lead-zinc ore have been shipped. General supervision of the new development program will be handled by Ralph Calhoun of American Zinc's El Paso office. Dick Britton will be in charge locally. When production starts, American Zinc will probably send ore shipments to the Peru mill at Deming, N. M., then handle the concentrates at its own smelter at Dumas, Tex.

California Manganese Plant

Erection of a manganese concentrating plant is reported planned at Hayfork, Calif., by McLaughlin Corp. of Texas. The company controls a large manganese deposit 15 miles from Weaverville, Calif. The new plant is expected to cause increased activity in exploration and development of numerous known deposits of manganese in Trinity County.

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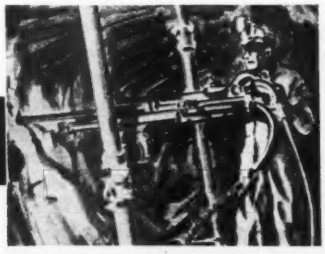

Tungsten carbide, Rok-Bits: 4-Point, Cross-Bit or 2-Point, Chisel Bit—gauge sizes, 1¾" to 4".

With drilling speeds never before possible becoming commonplace on job after job which has switched to Rok-Bits—orders and re-orders from satisfied customers—it will pay you to check your present bit performance against Rok-Bits. You'll not be sorry. Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa. 350 Depot St., Asheville, N. C.

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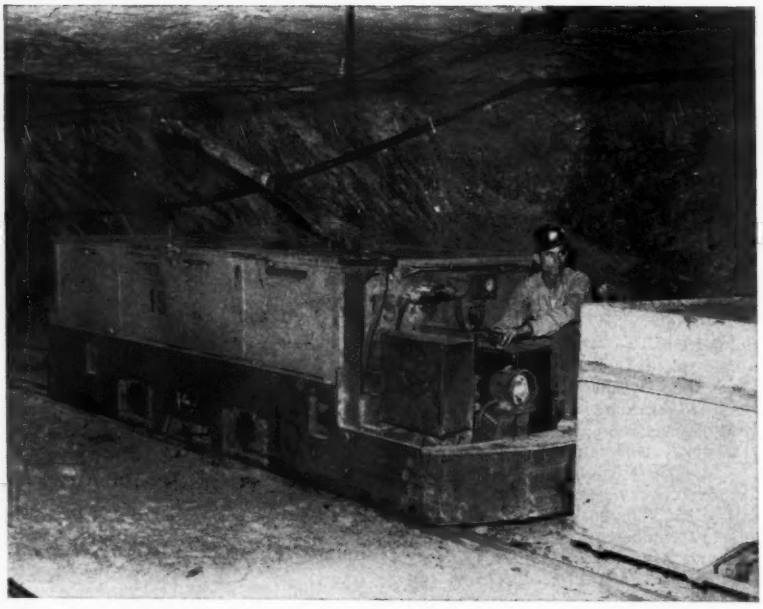

Take Combination Locomotives for Example

In a combination trolley-battery locomotive, the battery is charged directly from the mine d-c power supply so that charge rates are not critically controlled. Edison Nickel-Iron-Alkaline Storage Batteries meet this condition consistently. In fact, they can safely be charged at full normal rate at any state of charge and, for short periods of time, at even higher rates. Nor do they require equalizing charges. When used in straight battery locomotives, they usually can be charged in six to seven hours; this helps get the charging done during off-peak hours.

However, their non-critical charge characteristics are only one of their advantages. They are *durable mechanically:* grids, containers and other structural parts of the cells are of steel. The alkaline electrolyte is a recognized preservative of steel. They are *foolproof electrically:* they are not injured by short-circuiting, reverse-charging or similar accidents. They *withstand temperature extremes:* they are not injured by freezing at any state of charge because the density of the electrolyte does not vary appreciably with the state of charge; they are easily ventilated for rapid cooling. They can *stand idle indefinitely* without injury: they are merely discharged, short-circuited, and stored in a clean, dry place.

These characteristics add up to trouble-free operation, unequaled long life and economy per year of operation. The combination of these factors helps explain the preference of cost-conscious users. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. Thomas A. Edison of Canada, Limited, Montreal.

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STORAGE BATTERIES

U. S. Gold Mine Active

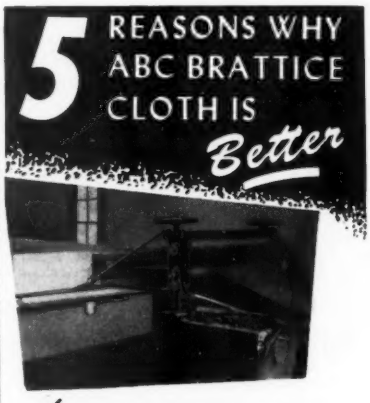
The United States Gold Corp. has reported cutting a rich vein at its property near Twin Bridges, Mont. Pat Clark, general manager, reports the Mohave tunnel has opened a four-foot vein, carrying gold, silver and copper.

The property, 12 miles from Twin Bridges, was equipped with a mill by Inspiration Gold Mining Co., in the late 1930's and 80 percent of the equipment is still on the ground, although the mine was closed during World War II by order L-208.

New Park Completes Examination

New Park Mining Co. has completed a geochemical examination of about 500 acres of ground in the Park City, Utah, district in search of lead-zinc ores.

Despite the fact that no ore strikes have been made as a consequence of the examination, the work has not been without value. Utilizing this new technique, New Park has been able to evaluate a large area at reasonable expense. This has been of definite assistance in determining what claims should be kept under option or lease, and whether certain ground was worth the annual assessment work required.



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Nevada-Massachusetts Expands

Operations of the Nevada-Massachusetts Co., Nevada's largest tungsten producer, are being expanded at their scheelite properties in Mill City, Nev. Capacity of the concentrating plant has been increased from 400 to 500 tons of ore daily and mining operations have been accelerated. The mill also handles custom ores and has been designated as an ore-buying station for tungsten by DMA.

Lucky Friday Production Up

Lucky Friday Mining Co., in the Coeur d'Alene district of Idaho, has opened its vein system on the 2000-ft level, with 4-ft showing of ore which assays good silver, lead and zinc values. In addition to the high grade, the vein shows several feet of mill feed. The company has increased production from 50 to 75 tons per day.

AS&R Will Develop Silver Bell

American Smelting and Refining Co. has announced its plans for the development of the Silver Bell copper property in Pima County, Ariz., 45 miles northwest of Tucson. Cost of the project is estimated at $17,000,000 and will be financed entirely by the company.

Development of the property was made possible by an agreement with the Defense Minerals Administration under which the government agrees to buy at 24.5 cents per lb up to 177,000,000 lb of the first 197,000,000 lb of copper produced if the company is unable to sell the copper at that price on the open market.

Production is expected to get under way in about two years, and the government's responsibility to buy the copper expires after 5½ years from the start of production. It is believed that the mine will produce at the rate of 36,000,000 lb annually over a period of about 12 years.

AS&R Co. has conducted extensive geological exploration and churn drilling at Silver Bell during the last five years, and has been interested in the district since 1915. The deposit is described as being a "marginal one" which required a contract for a floor price before production plans could be made. The mine is to be converted to an open-pit development.

T. A. Snedden will be in charge of operations as superintendent, while F. V. Richard, manager of the company's Tucson mining division, will have general supervision of the project. Richard will work under the direction of Darwin J. Pope, general manager, Western Mining Department, Salt Lake City.

—1952 Metal and Nonmetallic Mineral— Mining Convention and Exposition

Denver, Colo., September 22-25

Merrill E. Shoup

Wm. J. Coulter

Otto Herres

C. B. Stainback

PLANS for the 1952 Metal and Nonmetallic Mineral Mining Convention and Exposition of the American Mining Congress to be held in Denver, Colo., September 22-25 are rolling right along under the general direction of Merrill E. Shoup, President of The Golden Cycle Corp. and Chairman of the AMC Western Division, Charles B. Stainback, Westinghouse Electric Corp., Chairman of the Manufacturers Division, and William J. Coulter, Vice-President, Climax Molybdenum Co., and General Chairman of Arrangements.

Otto Herres, Vice-President, Combined Metals Reduction Co., of Salt Lake City and Pioche, Nevada, has accepted the post of National Program Committee Chairman. In this capacity he will lead a nationwide committee in developing the program for the Denver meeting. As the demand for metals and minerals is intensified by requirements for the accelerating defense effort, this year's Convention will be particularly important and will bring topnotch discussions of mining's problems by leading authorities in every field.

The famed Mining Show, an exposition of mining and milling machinery and equipment of all types, will be bigger and better than ever. No mining man can afford to miss the opportunity to see at first hand the latest models of modern labor-saving devices designed to multiply the efforts of every underground and surface worker in every branch of the mineral industry. Plan to attend and learn how to put out more vitally needed metals and minerals all day, every day.

So important a Convention and Exposition is bound to draw a heavy attendance and Denver's hotels and motels have promised to do their utmost to accommodate all comers. The Housing Committee, working with the Denver Convention and Visitors Bureau, will handle all reservations. This arrangement assures the full and equitable use of all the city's facilities. Assignment of accommodations will not be made until late June, but reservations should be made as soon as possible. A handy reservation form has been mailed to all members of the industry. Those who have not yet received one can write directly to the Denver Convention and Visitors Bureau, 225 West Colfax Avenue, Denver, Colo.

Mill Nevada Scheelite

Installation of a concentration plant was begun recently at property of the Lakeview Tungsten Co. at the mouth of Humboldt Canyon near Lovelock, Nev. An extensive deposit of commercial grade scheelite has been developed in the area which is noted for production of gold, silver and other metals. A 50-ton capacity mill will be operated on a 1000-ton ore dump while development progresses.

Process Bentonite

A large bentonite processing plant at Basin, Wyo., built by the Magnet Cove Barium Corp., began operations late in December. Bentonite from the mine is trucked eight miles to the riverside plant. Most products will be sold to the oil industry.

Establish School Fund

A $100,000 trust fund to be used to help students attending Idaho colleges has been set up by Sullivan Mining Co.

Only sons and daughters of employes of Sullivan Mining Co., Bunker Hill and Hecla and other companies operating under one of the three firms, will be eligible to receive aid from the "Hecla-Bunker Hill Scholarship Fund." Trustees—J. E. Buchanan, president of the University of Idaho; Stanly A. Easton, president of the Bunker Hill and Sullivan Mining and Concentrating Co., and L. E. Hanly, chairman of the board, Hecla Mining Co.—will determine the qualifications of applicants and decide on amounts to award.

Coronado Prospecting

Coronado Copper & Zinc Co. is drilling a series of deep holes in virgin country about a mile northwest of its Afterthought mine at Ingot, Calif. The company is reported concentrating 100 tons of zinc-copper ore daily at the Afterthought which is developed to a depth of 800 ft. Ore bodies carry important amounts of lead, silver and gold. Selective flotation is used to effect a separation of the various ores.

Begin Uranium Production

Titanium Metals Corp. has announced that production of titanium has begun at its newly constructed plant at Henderson, Nev. The company, owned jointly by National Lead Co. and Allegheny Ludlum Steel Corp., intends to expand output rapidly until an initial production goal of 10 tons per day is reached late next year. This will be equivalent to eight times the present world production of uranium.

To Aid Small Mexican Miners

The Mining Commission of the Chamber of Deputies in Mexico has discussed with Antonio Martinez Báez, Secretary of Economy, the creation of a new organization, Fomento Minero Nacional (Promotion of National Mining), destined solely to aid small independent miners in supplying the needs of private industry and for the exploration of new metalifercus regions. The new organization would also have policing powers over large mining firms. It is claimed that the unit would serve as a means to assure mining reserves for the nation.

Start Sulphur Production

President William Marquette of the Wyoming Gulf Sulphur pilot plant west of Cody, Wyo., has announced that the plant is now in full operation. Chief markets presently are in Massachusetts and Oklahoma. The plant is the first of its kind in Cody Co.

Testing Utah Limestones

Prospecting has been revived in the Mercur district of Tooele County, Utah by Snyder Mines, Inc. of Salt Lake City, in cooperation with eastern interests. The firm is diamond drilling for the tilted limestone beds so productive at shallower depths, in the adjacent Ophir district. To date the drills have not encountered the beds, estimated by geologists to be 1800-2000 ft below the surface in this area.

Sink Dayrock Shaft

Day Mines, Inc., Wallace, Idaho, announces it will sink its Dayrock mine shaft an additional 400 ft below the present 800 ft level, from which the company is producing 230 tons of ore daily.

U. S. S. R. & M. Expands

Roy C. Bothwell, president, Bingham Congor Copper Co. and United Bingham Copper Co., Salt Lake City, Utah, and W. C. Page, vice-president and general manager of western operations, United States Smelting Refining and Mining Co., in a joint statement have announced that stockholders of the first two companies have approved an agreement and plan of reorganization. The plan calls for U. S. S. R. & M. to exchange 20,014 shares of its common stock for all of the properties of United Bingham and Bingham Congor.

Under this plan two copper companies will exchange stock of United States Smelting Refining and Mining Co. received under the plan for their outstanding stock. Upon completion of the transfers and exchanges contemplated by the plan, United Bingham and Bingham Congor will be dissolved.

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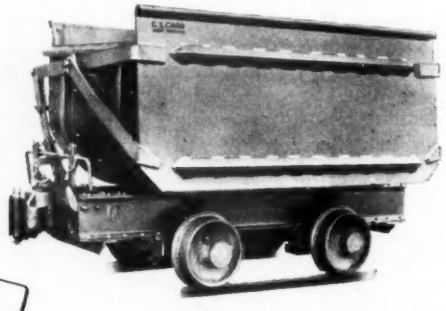

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Korea Furnishes Tungsten

The Republic of Korea is supplying the United States with its output of tungsten, the Department of the Army has announced.

Korea, which has one of the largest tungsten mines in the world, is producing approximately 200 tons a month. Some of the tungsten mines are located on ground which has seesawed back and forth between the United Nations troops and North Korean and Chinese Communist forces. In some instances the tungsten is mined while U. S. security troops protect workers from guerilla action.

Will Mine Manganese

Properties of the old Superior and Boston Mining Co., near Globe, Ariz., have been acquired under lease and option by the Copper Hill Mining Company, Inc. First work by the new operators will be directed toward manganese production. A shaft is now being sunk on one of the four manganese veins. Principals in the Copper Hill Mining Co. are T. R. Black, president; T. R. Black, Jr., vice-president and treasurer; and L. O. Goodman, secretary.

Explore For California Zinc

The United States Government has entered into an agreement with the Glidden Co. to bear half the cost of exploratory diamond drilling on Glidden's zinc properties in Shasta County, Calif., Adrian D. Joyce, Glidden board chairman, announced recently. Under provisions of the contract, the Government will allow Glidden to use Government barges on the Shasta Lakes to move in the necessary drilling equipment. Glidden is retaining the E. J. Longyear Co., Minneapolis, Minn., to do the diamond drilling.

When Glidden originally acquired the zinc properties the price of zinc concentrates was $60 a ton. The price rapidly dropped to $33 a ton and, accordingly, plans to operate the properties were abandoned until such time as zinc concentrate prices would afford a margin of profit. Present price of zinc concentrates is $135 a ton and likely to go higher. As a result, the Government has been urging Glidden to open up the properties.

If the exploratory drilling confirms the reserves of 225,000 tons which were previously estimated, underground mining operations will begin at the earliest practicable date.

Zinc ore mined from the properties will be moved by barge across the Shasta Lakes to facilities of the Southern Pacific Railroad. The ore will then move to a commercial smelter, where it will be refined into slabs or pigments.

The zinc ores in Glidden's properties contain a considerable amount of cadmium, presence of which in zinc once carried a penalty in the form of a stipulated deduction from the going market price of zinc. Present price of cadmium, which has become a strategic material, also in short supply, is $2.55 a pound. Glidden's zinc concentrates contain about 100 pounds of cadmium per ton. If extraction of the cadmium from the zinc ore proves economically feasible, the cadmium in a ton of ore will be worth $255, actually more than the balance of the zinc concentrates.

Developing Lead Mine

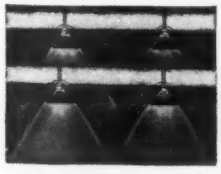
Frank Marr, president of the Spokane-Idaho Mining Co., has announced his company will develop the old Cleveland lead mine in Stevens County, Wash. and operate it on a profit-sharing lease. The road to the mine is being repaired and the 1500-ft main tunnel reopened. Dewatering of a 65-ft winze will be followed by diamond drilling from a station 35 ft down in the winze. The Cleveland property has been operated intermittently since 1892.

New "Fine Mesh" Capacity

The Leahy No-Blind Vibrating Screen, the screen with the differential vibration (snap action), has long been famous for its ability to screen wet or dry materials in the fine mesh range while minimizing blinding. Now its efficiency is greatly increased on dry screening by the addition (optional) of FlexElex electric heating of screen cloth for the screening of damp fines. Wires are kept dry and open for full capacity, non-stop production. This steps up tonnage, saves labor by eliminating blinding, and greatly lengthens the life of screen cloth. Ask for Bulletin 15-J.

Concenco Spray Nozzles

For wet screening these handy nozzles are simple, flexible and economical. All you do is drill your holes, clamp on and get results. They can be definitely aligned for washing, sluicing or spraying according to need. They are removed or replaced in a moment's time.



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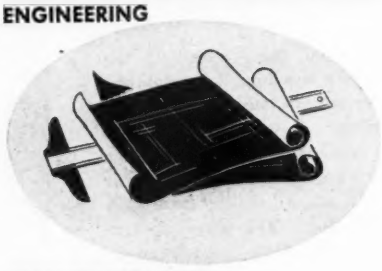

Here is a SWECO product, proven in principle and application, that is attracting great interest in the mining industry. This single or multi-deck vibrating screen employs an entirely new screening motion. No substructure vibration. Unit can be mounted on skids, wheels, top of bins, wood floors, etc. It produces greater production capacity, handles wet or dry materials and involves only three moving parts. Laboratory accurate, classifying and dewatering up to 325 mesh on a production basis. Screen cloth life is guaranteed, as is lowered maintenance and power requirements. Investigate this latest SWECO development for the mining industry.

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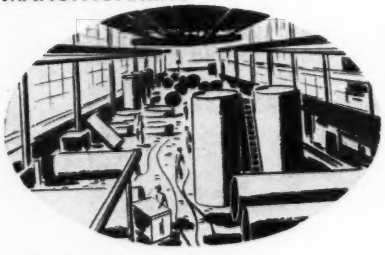

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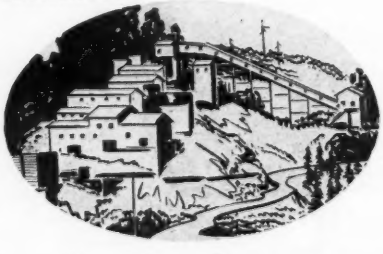

For years, SWECO has been favorably known for its Pre-fabricated Heavy Media Separation Plants, designing, fabrication and construction work, together with a complete Mining Metallurgical Laboratory serving the mining industry.

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Hanover Strike Settled

On January 24 the long and bitter strike at the Hanover, N. M. mine of The New Jersey Zinc Co. was ended after three days of meetings in El Paso which were called at the request of union officials. The company maintained its position completely on the main issues of the strike.

The settlement included an improved pension plan and an insurance plan, previously offered by the company and already in effect at other New Jersey Zinc properties. Subject to WSB approval, wages were adjusted to district parity retroactive to October 1, 1951. All men who have been working will share in the adjustment and will be retained on the payroll. The new contract will run until July 31, 1953 with a wage reopening on July 31, 1952.

Move Tungsten Mill

Baltimore-Camas Mines, Inc. is moving its 100-ton tungsten concentration custom mill from Hailey, Idaho to the outskirts of Ely, Nev. The city of Ely has granted a 10-acre site for the mill and 10 acres for a tailings pond. Expected to be in operation by the spring, the mill was originally set up in Hailey to work on gold ores last year. Water for the concentrator will come from nearby Lackawanna warm springs at Ely. The mining firm is now working tungsten properties at Cherry Creek and Spring Valley, Nev., and at Cherry Creek and Trout Creek, Juab County, Utah. About one third of the mill's capacity has been allotted for custom milling.

Coeur d'Alene Venture

Diamond drilling from east-west lateral drifts at the bottom of the Vulcan Mining Co.'s shaft in Lake Gulch, just west of Wallace, Idaho, has revealed an extensive ore zone 40 ft wide. The project is the most daring prospect venture ever attempted in the Coeur d'Alenes. It consisted of sinking a four-compartment shaft to a depth of 3000 ft without pausing to prospect on any level. A crosscut at the bottom of the shaft opened one vein of silver-lead ore on the north side of the shaft and on the south side of the shaft the crosscut first opened a 35-ft width of Revett quartzite containing bunches and streaks of galena ore; a little further south the crosscut encountered a well-defined fissure vein of silver-lead ore and still further south another vein of the same type of ore 8 ft wide. The crosscut was continued some distance further south, still in mineralized territory. This part of the work is headed towards Day Mines' Fern group of claims, which has a very extensive outcrop of mineralized vein matter.

First Greater Butte Ore Near

April of this year is expected to see the first ore produced at the Greater Butte Mining Project according to a recent announcement by F. A. Linforth, assistant to the vice-president of the Anaconda Copper Mining Co., in Butte, Mont. Work on the project has been progressing on schedule, and the Kelley shaft, largest in the country, is now 1507 ft deep. About 825 ft of the concrete shaft lining has been completed. The first ore will come from the 600 ft level, where the haulway from the orebody to the Kelley shaft is practically completed. Connections between the shaft and the orebody have also been made on the 1300 and 2000-ft levels.

Production is expected to reach 6000 tons daily by September 1952 and by the fall of 1953 should reach 10,000 tons daily. Thereafter, the addition of an auxiliary shaft will enable production of 15,000 tons a day.

Mercury Mine Bought

The Harlin Co., Inc., of New Jersey, has purchased the Great Northern Mercury mine northeast of Yreka, Calif., from the Humphreys estate, and is preparing to install new equipment. A 150-ton mill is planned and will include a new type concentrator. The property was operated on a substantial basis during the war years. Harlin made many tests of the property after acquiring the Carl W. Yates lease a few months ago. Extensive exploratory and development work is planned.

Retain Engineering Firm

Frank Eichelberger and associates, mining engineers of Spokane, Wash., have recently been retained to take over active management of the Talisman Mining and Leasing Co. property, once known as the Laurier Gold-Copper Mine, at Laurier, Wash. Henry T. Born of Hayden Lake, Idaho, president of the mining company, made the announcement of the new management contract. Ernest E. Eddy will be resident engineer at the mines for the Eichelberger firm.

Peaceful Use of Atom

Small amounts of electric power have been produced from heat energy released in the operation of the experimental breeder reactor, recently completed at the National Reactor Testing Station in Idaho, it was announced recently by A. Tammaro, manager of the Chicago Operations Office of the Atomic Energy Commission.

In a trial run on December 21 and 22, 1951, electrical power of more than 100 kw was generated and used to operate the pumps and other reactor equipment and to provide light and electrical facilities for the building that houses it. Test operations will be resumed after further adjustments of the reactor system.

The heat energy generated was removed from the reactor by a liquid metal at a temperature high enough to generate steam to drive the turbine.

Kaiser Coal Mines Sold

Mineral Development Corp. has purchased the Somerset and Oliver Commercial Coal Mines of the Utah Fuel Division, Kaiser Steel Corp. Combined capacity of the mines, located at Somerset, Colo., is 1750 tons per day.

Erect Soda Ash Plant

Near Green River, Wyo., a soda ash plant will soon be under construction for the Intermountain Chemical Co. The company has been issued a certificate of necessity by NPA and an allocation of materials from DMPA. Expected to produce about 300,000 tons a year, six percent of the nation's output, the plant will be completed in 1953, according to C. C. Romano, resident manager. The soda ash will be made from trona (sesqui-carbonate) reserves, the world's only known trona supply in natural mineral form.

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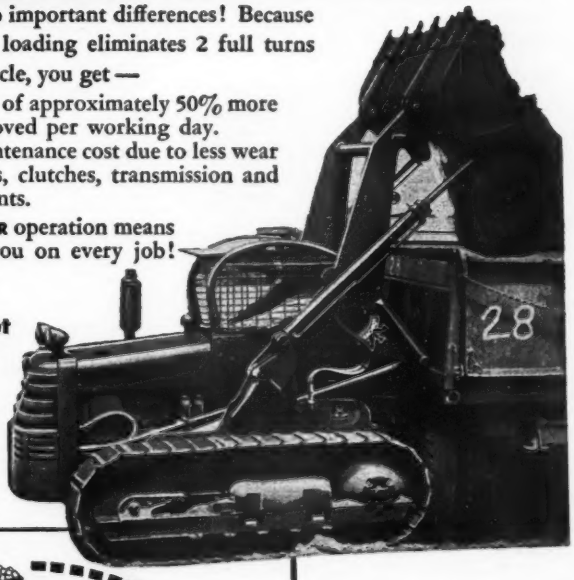

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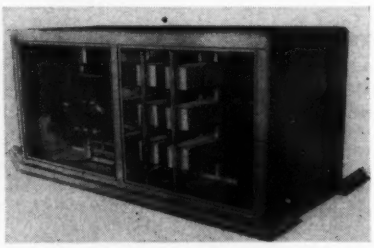
Manufacturers Forum

Gain Rectifier Sales Rights

The Joy Manufacturing Co. has concluded an agreement with Clark Electronic Laboratories, Palm Springs, Calif. which gives Joy exclusive sales rights to the mining industry for CELAB Selenium Rectifiers. These rectifiers offer many advantages for the conversion of ac to dc power for underground use. They are more efficient than motor-generator sets, particularly when load is reduced. Their remarkable efficiency at light loads permits leaving them in circuit continuously, according to the manufacturer. They are light-weight units



and it is claimed they require no attendance. Unlike mercury-pool rectifiers, CELAB units never pass power in a reverse direction. An advanced plate-design, it is claimed, results in maximum ac volts, rms per cell, of 50, as opposed to the 18 to 26 volt ratings of conventional selenium rectifiers. A two-page bulletin No. RES-810, giving a full description of CELAB rectifiers, is available from Joy Manufacturing Co., H. W. Oliver Bldg., Pittsburgh 22, Pa.

WEMCO Announces New Attrition Machine

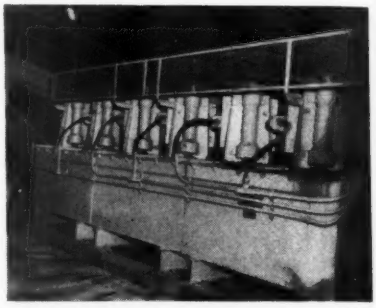
A new metallurgical and industrial processing tool—the WEMCO Attrition Machine—has been announced by general manager, Ralph B. Utt, of Western Machinery Co. of San Francisco.

Results from field operations, and extensive laboratory investigations indicate wide application in ore dressing, coal preparation, sand and gravel beneficiation, and industrial processing industries.

According to the manufacturer the attritioning action in the new machine produces two broad effects on the material treated. These may be gained singly or in combination. For the treatment of mineral particle surfaces, the unit has proved effective in the removal of slime, oxidized, and reagent coatings undesirable in further processing. In the treatment of ores and industrial minerals where particles are cemented together, the attrition machine may be applied to liberate particles from the cementing material.

The operating principle of WEMCO's newest product is based on the controlled turbulence of high density pulps. Resultant action simulates the rubbing of particle against particle. The optimum density is of the utmost importance and depends on the problems at hand. To date several problems have been encountered where best results were obtained at 83 percent solids.

Additional information may be ob-



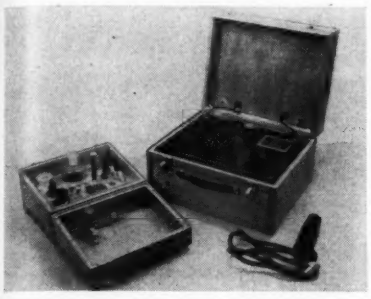
tained by directing requests to WEMCO's home office at 760 Folsom Street, San Francisco.

Furnish Power for Aluminum

Eighty Nordberg gas burning Radial engines supply approximately 150,000 hp for the first two potlines of the Chalmette, La. Reduction Plant of Kaiser Aluminum and Chemical Corp. Each potline is served by a 40-engine power plant. It is anticipated that the Chalmette plant, the first to go into production under the nation's aluminum expansion program, will produce 400,000,000 lb of aluminum from eight potlines annually when completed. Forty of the 80 engines are shown here.

Announce pH Meter

A new Philips Universal pH Meter, precision built for reliable service and for quick, accurate measurements of hydrogen-ion concentrations, is now available from the Research & Control Instruments Division, North



American Philips Co., Inc., 750 South Fulton Avenue, Mount Vernon, N. Y. It is designed for all pH and rH work, for potentio-metric titrations and for oxidation-reduction-potential investigations.

For laboratory research and industrial testing purposes the meter is said to provide a measuring accuracy of 0.01 pH or 0.5 mv, a range of 0 to 14.15 pH and 0 to 1415 mv, absolutely currentless measuring with no phenomena of polarization, zero indication by cathode ray tube, can be used with glass, quinhydrone, hydrogen and platina electrodes and is direct calibrated for the first three.

Settle Suit

As a result of an amicable settlement, the suit of The Sunnyhill Coal Co. vs. The Jeffrey Manufacturing Co., which was filed on May 23, 1951, has been dismissed, and the parties have terminated their previous contract. Jeffrey has received an exclusive license to manufacture and sell Colmols and Molveyors in the United States.

With this complete settlement, Jeffrey will continue its development, manufacture and sale of Colmols and Molveyors, which have already demonstrated their capabilities in the mining of coal.

Solve Grinding Problems

Robert Holmes & Bros., Inc., have recently placed on the market two new Holmes Laboratory Hammermill Crusher models and one new Holmes Pulverizer model.

Originally designed and manufactured to crush and pulverize coal samples, the scope of the equipment has been widened to other materials such as used welding flux. The new design of these units incorporates improvements suggested by field experience of Holmes equipment users.

Full details on crushers and pulverizers along with assistance on grinding problems can be had, at no obligation, from the company at 510-520 Junction Ave., Danville, Ill.

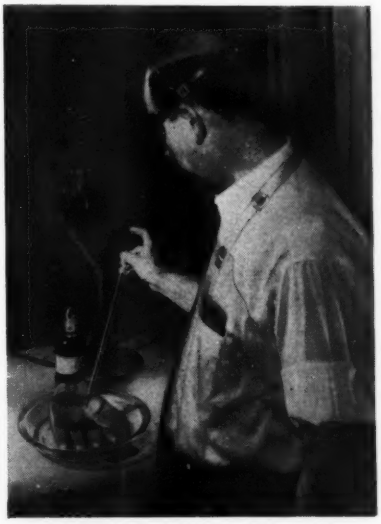
Joy Expands Field

Joy Mfg. Co. has announced its entrance into a broader field of coal equipment manufacturing. J. D. A. Morrow, company president, told an annual stockholders' meeting recently that Joy's plan will be to supply its customers with many accessories now purchased from other producers. Drill bits and "other new items" on which Mr. Morrow said, "we cannot elaborate at this time," will be included.

Glove Resists Chemicals

A new long-wearing all-purpose work glove with special coating that sheds moisture and resists chemicals better than rubber is described in a new bulletin of the Mine Safety Appliances Co., Pittsburgh, Pa.

The new M. S. A. All-Purpose Work Gloves are said to wear like leather, yet cost little more than ordinary can-



vas gloves. The vinyl-plastic coating stays flexible in extreme cold, does not become "tacky" at any high temperature to which workers' hands are normally exposed, and is especially effective in combating strong acid concentrations. They will protect against concentrations of all acids, including sulphuric acid and oleum, and all caustics.

Although designed primarily for hand protection, the new gloves are tailored for comfort and utility. Seams are straight and there is no excess material in the finger crotches.

Detailed data is included in Bulletin No. CF-30, available without charge from Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

— *Announcements* —

Norman M. Godfrey has been appointed manager of the Eastern Sales Division of **Hewitt-Robins, Incorporated** it was announced recently.

Thaddeus S. Ullmann, assistant export manager of the **Eimco Corp.,** of Salt Lake City, recently returned to his New York City headquarters from a two months business trip to Western Europe.

Kennametal Inc., announced recently the appointment of **Benedict (Ben) Teano** as representative for the territory of southeastern West Virginia and eastern Virginia. Teano's former experience had been with the Consolidation Coal Co., Fairmont, W. Va.

M. F. Cunningham, vice-president in charge of sales, **Goodman Manufacturing Co.,** recently announced the appointments of **Paul Johnson** and **Charles Hoyt** as sales engineers to the staff of the company's Pittsburgh office. Johnson will make his headquarters at Fairmont, W. Va. Hoyt will center his activities in the Ohio field.

CATALOGS AND BULLETINS

AIR COMPRESSOR DRIVES. *Electric Machinery Mfg. Co., Minneapolis 13, Minn.* Up-to-date information on motor drives for all types of large air compressors is supplied in the new issue of the E-M Synchronizer, No. 32. This two-color, 24-page bulletin is illustrated with a wealth of tables, charts and graphs for matching motor characteristics to compressor requirements, as well as a technical discussion on "Synchronizing Power."

ARC WELDING. *Miller Electric Mfg. Co., Appleton, Wis.* Contains a description of the complete line of transformer type welding for all applications of the "Heliarc" process, with charts, specifications and recommendations for automatic control panels.

HEAVY DUMP TRUCKS. *Detroit Diesel Engine Division, General Motors Corp., 13400 West Outer Drive, Detroit 28, Mich.* Rear and bottom dump truck models from 10 to 34 tons rated capacity, an 18-cu-yd scraper and a loader are described in a new catalog of the Euclid Road Machinery Co., Cleveland. Listings of Detroit Diesel Engine Division and Euclid Distributors and Factory Branches throughout the country are also included.

TRAMP IRON REMOVAL. *The Eriez Mfg. Co., Erie, Pa.* "Non-Electric Permanent Magnetic Separators for Tramp Iron Removal" is the subject of this 16-page catalog. Complete descriptions of separators, pertinent engineering data including photographs, drawings and tabular specifications are given. Information on the selection of appropriate magnetic separators and a full explanation of the life of permanent magnets is included. Copies of the Eriez Catalog 15 are available from the company.

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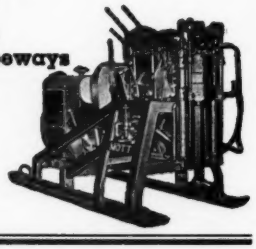

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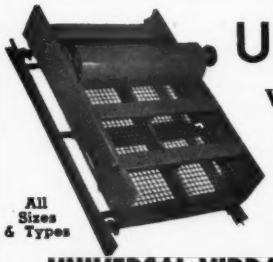

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